February 1940

TECHNOLOGY REVIEW

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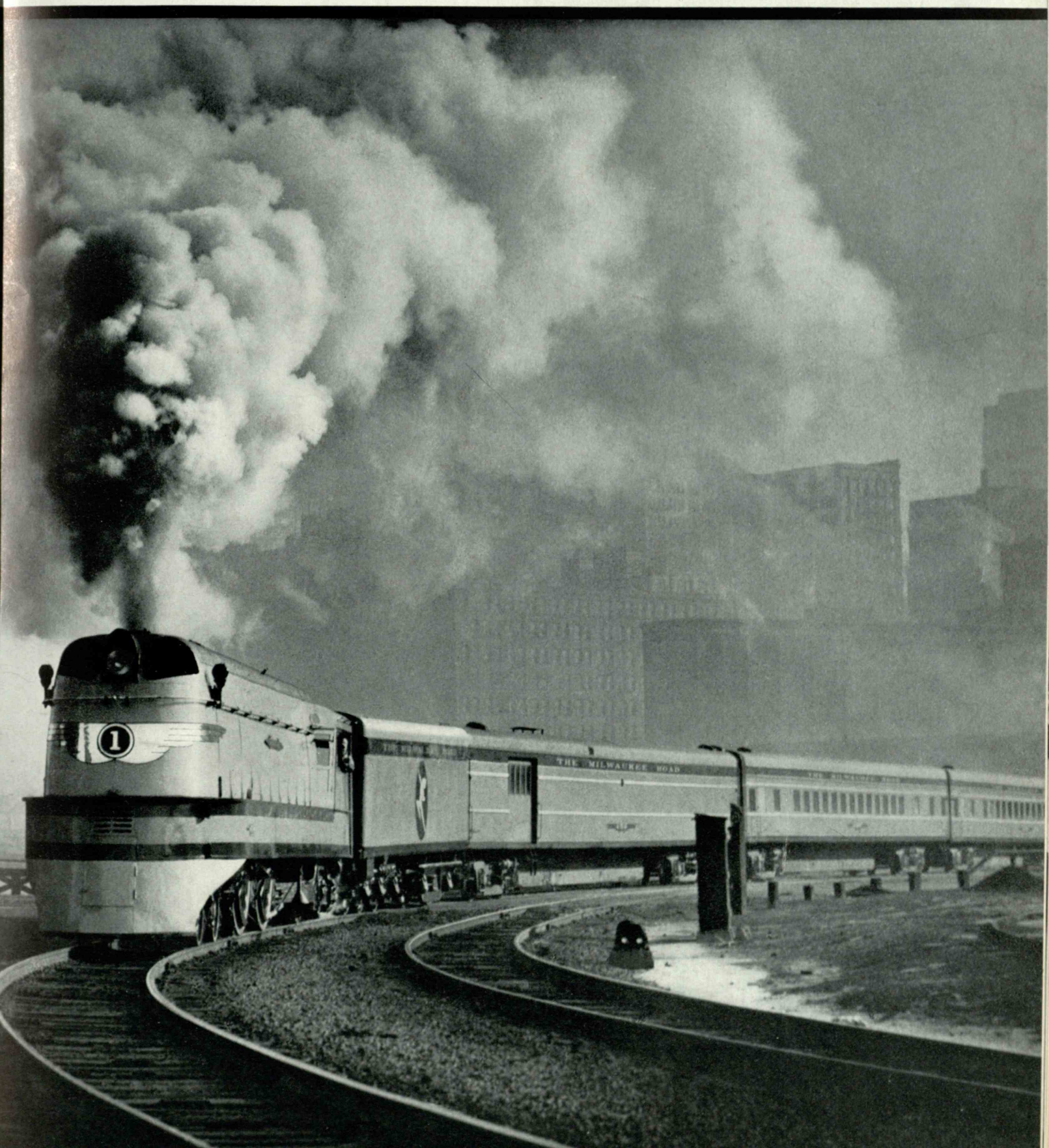

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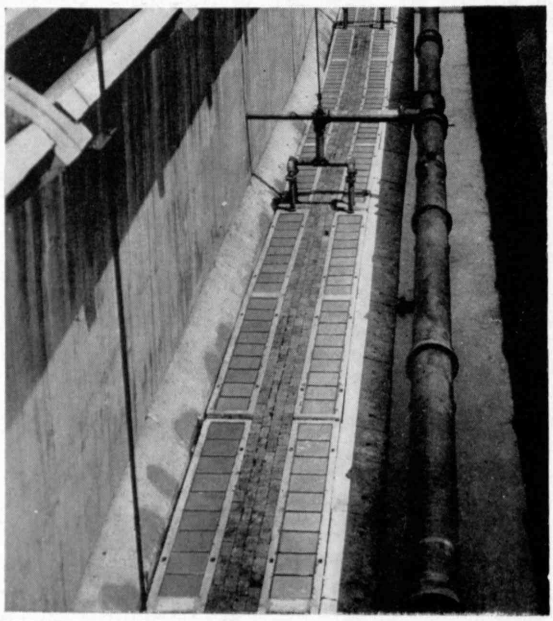
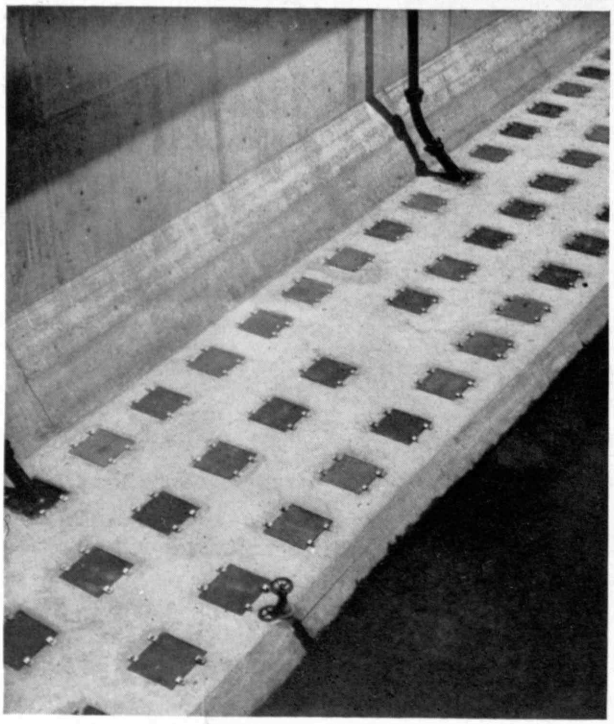
In Tanks of All Types

in Activated Sludge Plants the World Over . . .

NORTON POROUS MEDIUMS





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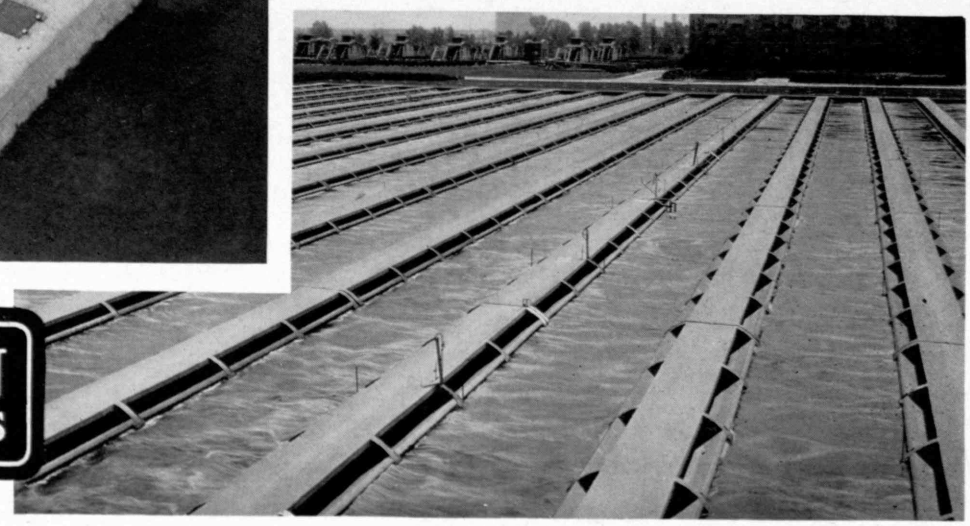
The mechanical details of activated sludge plant construction show development and research. Tanks have doubled in width, the aluminum plate holder shown in the center illustration has made for convenience of plate cleaning, while the precast concrete container in the top picture has reduced container cost.

Norton Plates have kept stride with other developments and offer maximum plate efficiency with a minimum of plate troubles.

NORTON COMPANY

Worcester, Massachusetts



NORTON
POROUS PLATES

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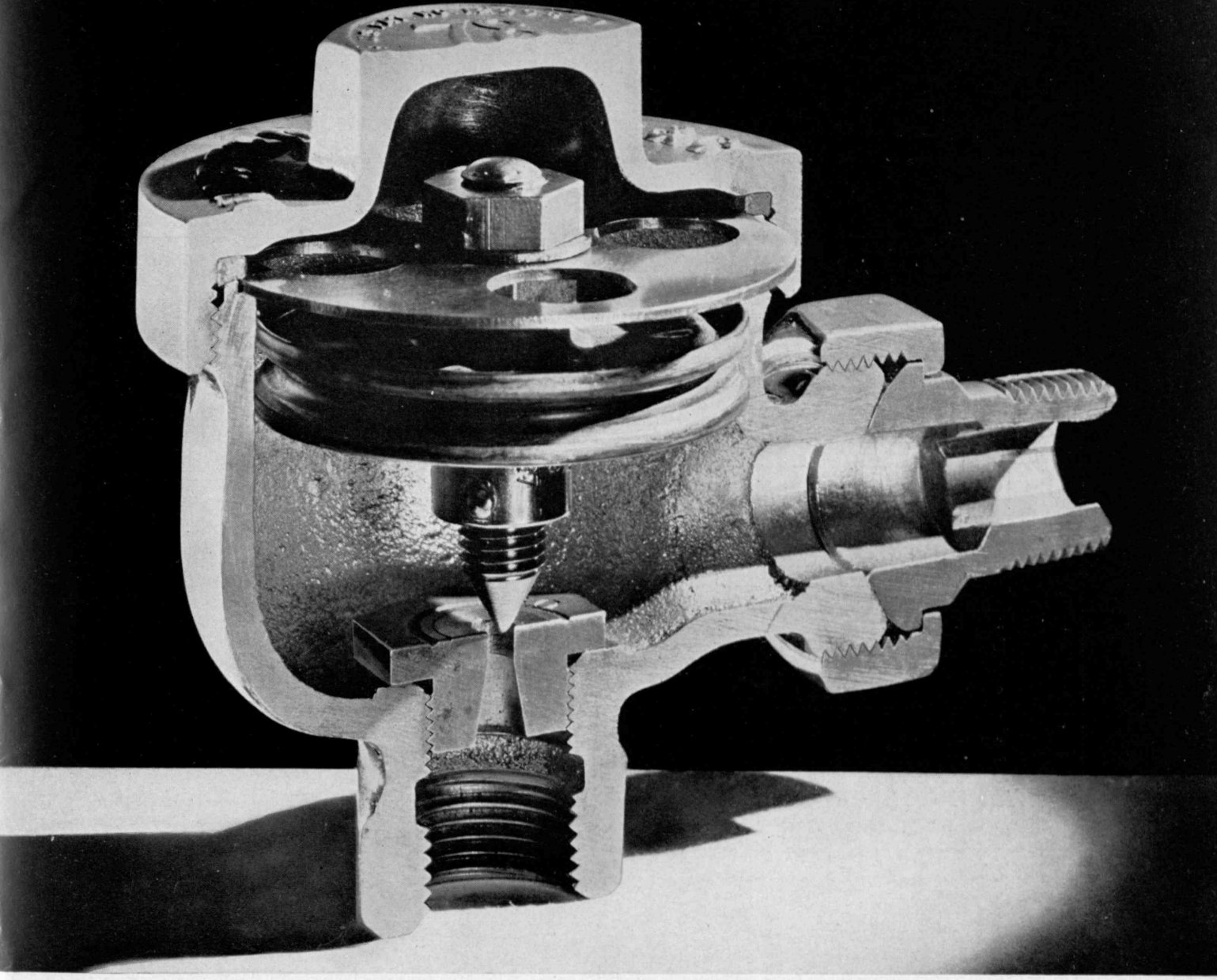

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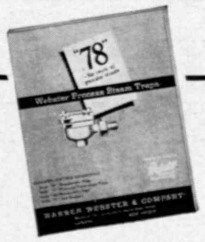
H. F. MARSHALL, '19



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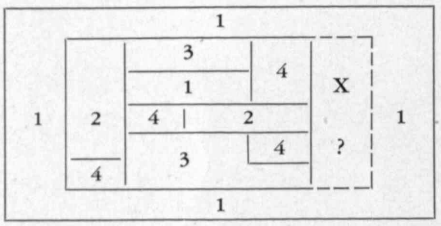

The diagram shows how four colors are used to color a map with "country" X absent. Note the changes necessary to make X a separate country.

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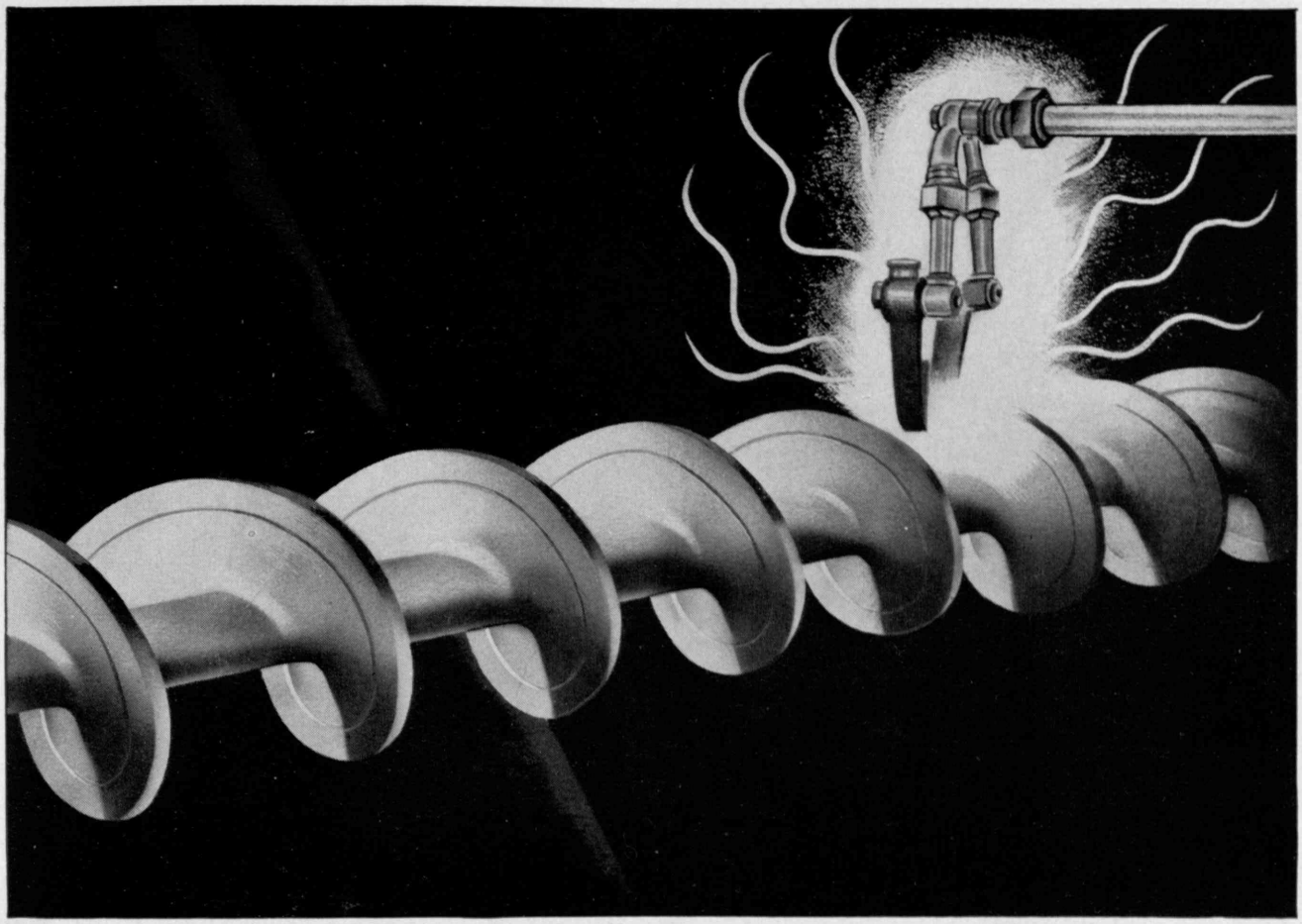
THE TABULAR VIEW

INTIMATELY concerned for over thirty years in the progress that has brought the Institute's Graduate School to the international reputation which it enjoys today, HARRY M. GOODWIN, '90, Dean of the School, is eminently qualified to discuss its history. The origins and growth of advanced study at the Institute are of special interest not only as an important part of the development of Technology itself but also as points of reference in the development of such work in the United States, for the beginnings at Technology were among the early examples of postgraduate study in scientific and technological subjects in this country. Advanced work was envisaged as part of the Institute's function from its earliest days. Dr. Goodwin in this issue (page 154) discusses the forms which this work took prior to the organization of the Graduate School as a separate administrative unit in 1932. Developments since then will be considered in our March issue. ¶ The Institute's deanery is generous with authors this month, its second representative being H. E. LOBDELL, '17, Dean of Students, student of railways. His decennial analysis of the possibilities of speedy travel over the nation's high iron (page 148) discloses noteworthy increases in the rapidity with which one may get from here to there, as well as records advances in design both for comfort and for speed. ¶ Another aspect of transportation is considered by JOHN W. MEADER, '19, who analyzes the family automobile with an eye to economics and to functionalism (page 157) to conclude that markedly different design can readily be justified on both grounds. Mr. Meader has served the automotive industry both at home and abroad, having spent some five years in Cuba and the Far East for one concern, and as many more working on foreign assembly-plant appropriations and budgets and making special studies of the British and German automobile markets for another. After a year with the Fokker Aircraft Corporation, during which he helped correct instability faults in the first F-32, then the largest airplane constructed, he joined the New York Trust Company where his general field is statistical and economic research, and his special preoccupation the forecasting of interest rates and business activity. ¶ CLARK S. ROBINSON, '09, Associate Professor of Chemical Engineering at the Institute and fourth alumnus author presented this month, is likewise a lieutenant colonel in the Ordnance Reserve of the United States Army and chief of the ammunition division, Boston District Ordnance Office. In discussing (page 152) American needs of wartime materials and the ways in which industry will be affected by the program planned by the government in the event of war, he thus joins Mr. Meader in drawing upon more than one department of a varied experience. Professor Robinson is the author of *Theory of Interior Ballistics* and several volumes on unit operations in chemical engineering. ¶ The cover this month introduces a new photographer, John Skara of Chicago, whose work is receiving increasing recognition.



LENGTHENING THE LIFE OF EXPENDIBLE PARTS

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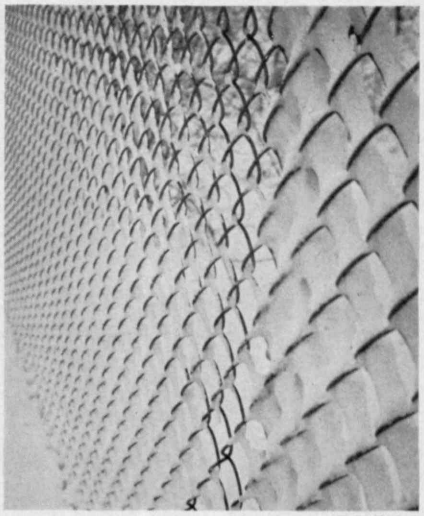

Snow on a fence

C. L. Fassett

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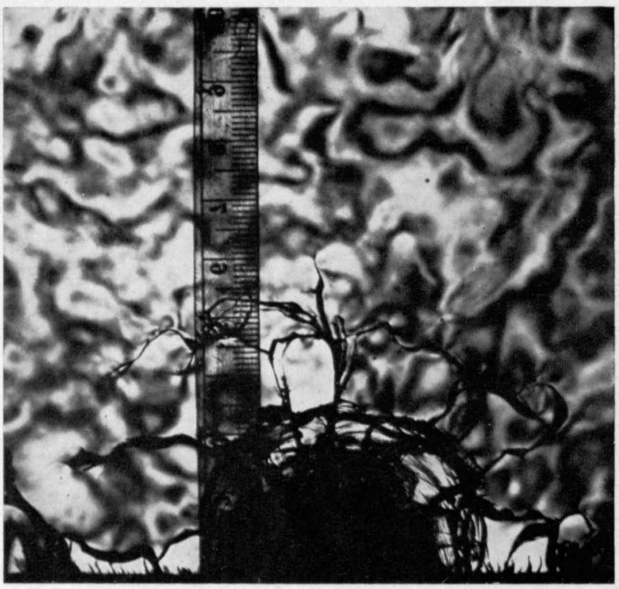
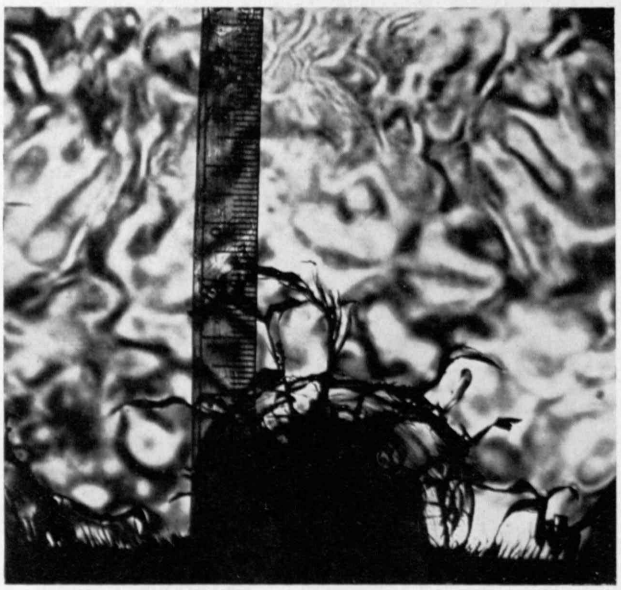
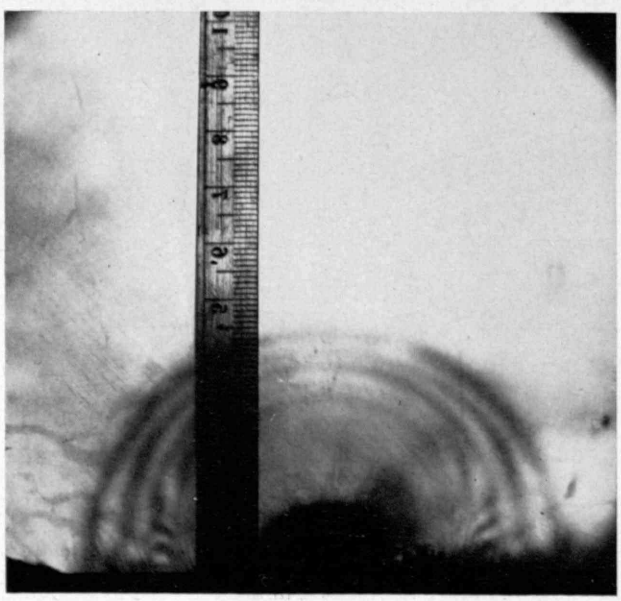
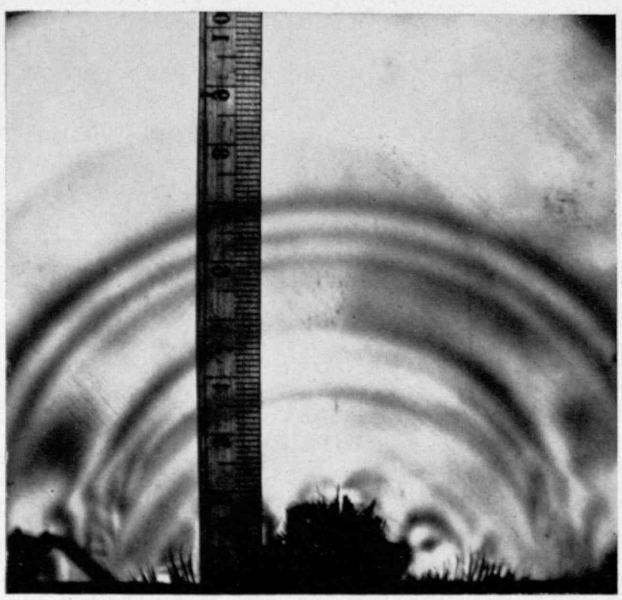




UNSEEN UNDULATIONS

High-speed photography with polarized light discloses in this series of pictures the fate of glass test plates when struck on the edge by a lead bullet nosed with a small steel ball. At the lower left corner of the page, compression waves set up in the glass by the bullet are seen moving outward from the point of impact, the velocity of the first wave front being 18,000 feet a second. The same glass is photographed again at the lower right, 4.75 millionths of a second later. In that wink of a superstroboscopic eye, the waves have spread farther, the distance between successive maxima (that is, the wavelength) appearing greater in the second picture, a fact which indicates that the first wave front is moving faster than the others. Small cracks on each side of the point of impact formed in the split-second interval. The three remaining photographs show later developments — later, that is, in terms of millionths of a second. The symmetrical waves have given place to jumbled patterns which change rapidly, as is shown by comparison of the adjoining picture with the one at the left above; they were separated in time by only five or ten millionths of a second. At the right above, the pattern of cracks has developed farther, and the black area indicating fracture extends halfway across the plate. These photographs were taken by Harold E. Edgerton, '27, Associate Professor of Electrical Measurements, and Frederick E. Barstow, '38, during a study of glass fracture which they are making under the sponsorship of five major glass manufacturers.





THE
TECHNOLOGY
REVIEW

Vol. 42, No. 4

February, 1940

The Trend of Affairs

Meet the Millibar

THE new year has brought a new word and a new idea to the American vocabulary to add further confusion, at least temporarily, to the already perplexed mind of the amateur weather prophet. We sat down to breakfast and the morning paper just after 1940 had become established, and turned to the weather report, only to find our old barometric pressures disguised by aliases. The report fairly bristled with "millibars," and there were a short explanation and a table telling us that 0.089 inches of mercury would henceforth be called three millibars.

As disturbed as anyone would be over the death of a dear friend, at the first opportunity we pressed our associates on the Institute's meteorological staff for an explanation. We were told: "A millibar is a unit of pressure equivalent to 1,000 dynes per square centimeter." That sounded like a nice round number, and we were sure that it must be good for something. "Or it is a thousandth of a bar, which is, of course, a million dynes per square centimeter," the expert continued. "Of course there's also a chemist's bar, which is equal to one dyne per square centimeter; but that is only a millionth part of the meteorologist's bar and has nothing to do with weather."

Trying to be tactful, we asked what that meant in plain, nontechnical English. "Well, take normal atmospheric pressure, for instance," the weather expert responded. "That is 14.66 pounds per square inch, or 29.92 inches of mercury, or 33.9 feet of water, or 1,013.25 millibars, or, of course, 1.01325 bars."

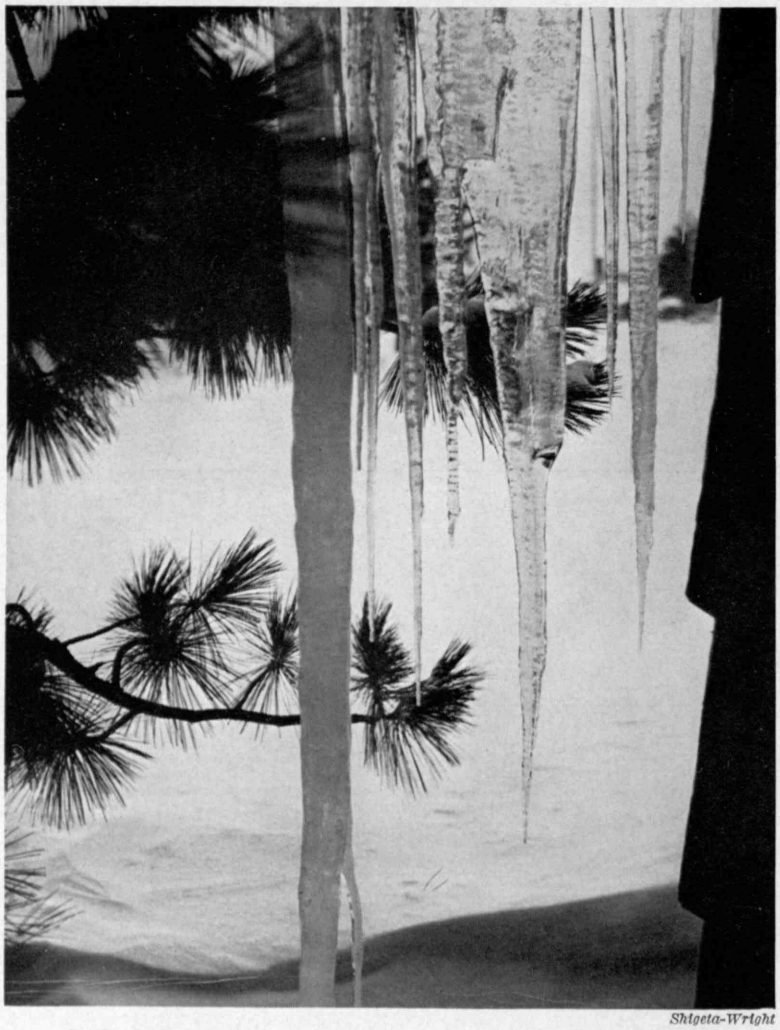
Thoroughly confused, we changed our course and asked for the origin of the idea and its application. As the whole explanation pieced itself together, we began to see that it was completely logical and really not so complicated as it appeared at first. We learned that the Norwegian meteorologist, V. Bjerknes, introduced the term many years ago and that it has long been in use in Europe. The British adopted the term in 1914 for general use and it has been used widely even in this country by meteorologists concerned with the study of weather in the upper air — in the troposphere, to be technical.

On January 2, the millibar was, in effect, brought down to earth in this country by the United States Weather Bureau, of which our own Carl-Gustaf A. Rossby is assistant chief. It is now recognized as the standard of measurement of pressures at the surface of the earth, as well as in the upper air.

Thus American usage now corresponds with a workable international meteorological standard. The adopted unit matches all other metric units in air-mass calculations for predicting weather. Furthermore, the millibar is much more logical, since it is strictly a unit of pressure. As the shock of losing the mercurial standard subsides, we agree that it was rather absurd to designate pressure in terms of "inches" of a column of mercury when we really were dealing with force per unit of area. Moreover, measurements in inches always had to be converted into millibars before the measurements could be used in making thermodynamical calculations.

Meteorologists and scientists in general, who must deal with data recorded in many parts of the world, regard the adoption of the millibar in the United States merely as one important step in the right direction — toward the adoption of the metric system for all units of measurement, including, eventually, the all-important shift from Fahrenheit to centigrade in temperature measurements.

Admitting that it will at first be inconvenient, even annoying, for the millions of amateur students of the weather, our meteorologists are convinced that we shall soon become accustomed to thinking in terms of millibars



Shigeta-Wright

Icicles in light and shade against the snow-laden pine twigs of winter may foretell the approach of spring.

just as well as we now think in terms of inches. As a special aid in making this transition, they suggest that we fix the number 1,013 in our minds as the normal atmospheric pressure in millibars and remember that a tenth of an inch by the old standard is approximately three millibars by the new (actually, 0.1 inch equals 3.37 millibars). So be it!

The Staff of Life Streamlined

WHEN William McKinley sat in the White House, an average American ate about one and an eighth barrels of flour a year; the analogous individual a generation later made away with only a little more than three-quarters of a barrel. The figures are 224 pounds for 1899; 155 for 1935. This streamlining of the staff of life has possibly come about partly through the desire to streamline the human form into something more nearly approximating divinity; more probable cause is the availability of a far wider range of diet in our times as compared with the late Gay Nineties.

The Department of Commerce observes, for instance, that between 1899 and 1931 per capita consumption of cereals (wheat, corn, barley, buckwheat) declined by 134 pounds, or 40 per cent; and that use of dressed meats went down 10 pounds, or 7 per cent. Paradoxically, sugar, that supposed fattener of fatteners, increased in per capita consumption 38 pounds, or 60 per cent. Vegetable oils went up 10 pounds, 500 per cent; fruits (fresh, dried, and canned) increased 33 pounds, 21 per cent; vegetables, 80 pounds, 35 per cent. But these figures do not suggest the increased variety of foods offered the public — the fact, for instance, that whereas apples were 60 per cent of the fresh fruits consumed in 1899, they made up only 40 per cent of the larger amount of fresh fruits eaten in 1931.

In part, but only in part, these changes in diet have been made possible by improvements in food-handling techniques, and it is not surprising that attempts have been made to adapt some of these improvements to breadmaking. Bread is a highly perishable food. During the World War, experiments in the freezing of bread were carried on in Holland, and research still continues to obtain an economical method of storing bread without its staling, in order to eliminate the higher wages paid to nightworkers and to prevent interruptions in supply because of strikes, wars, and other failings of organized society. A specific application would be the elimination of bakeries on ships as a result of the ability to store in the refrigeration vaults enough bread for voyages. A study by the American Institute of Baking showed that bread frozen at minus 22 degrees centigrade tasted as good as fresh bread for as long as fifteen or twenty days, and that even after forty days it was still salable. Lower temperatures prolong the period during which bread can be preserved without undue damage to flavor. The method, however, is not yet practical commercially.

Another problem facing the baker is that of spoilage by mold — a problem which is intensified by the greater water content of present-day breads and by the almost universal practice of wrapping the bread in waxed paper or the equivalent in order to keep it from drying out. The mold spores which are found in flour and are capable of surviving the baking cycle dote on high humidity. The addition of small amounts of acid, such as acetic acid, inhibits mold growth, but these substances interfere with flavor. Through the addition of the harmless salt, calcium propionate, as is now being done commercially, this difficulty is avoided and mold growth may be delayed, even under summer conditions, for periods up to two weeks.

Better methods of preparation, however, should not greatly alter present trends in consumption, although such improvements may accelerate the shift away from home baking by increasing the effective delivery radii of bakeries. Considering the length and intricacy of the breadmaking process, it is little wonder that housewives, by and large, have gladly turned the job over to central plants. During the 1899–1935 period, the amount of flour handled by the bakeries of this country increased from 20 pounds per person to 65 pounds, a gain of 225 per cent. Today not much more than a quarter of this country's bread is homemade, and that portion is made mostly in areas which the bakeries cannot serve.

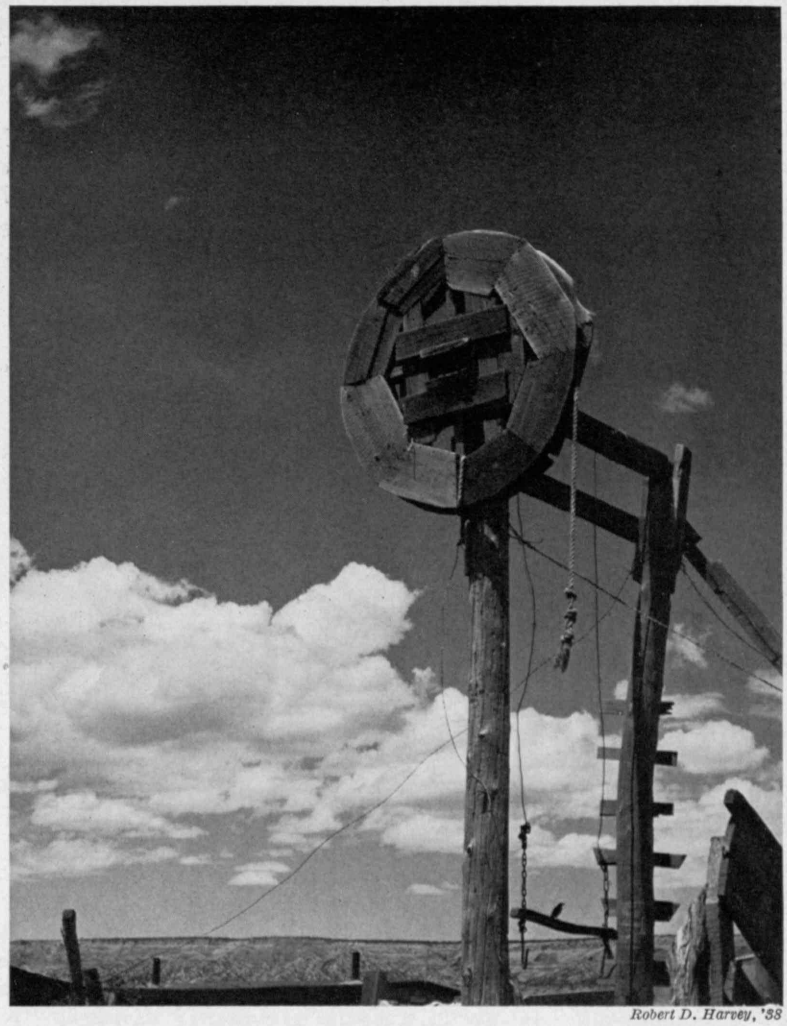
The most significant changes in the cereal portion of our dietary, however, concern neither quantity nor baking practices, but the flour itself. As far as baking is concerned, these changes are for the better, because present-day flours hold water well, are tough, easily

handled in large masses, and not unduly sensitive to variations in fermentation conditions. Thus the baker can without difficulty add 40 parts of water to the 75 parts of solids in his mix; of these solids perhaps 65 parts are flour which already contains up to 14 per cent moisture. Made from hard, strong wheats, his flours show excellent ability to retain the carbon dioxide formed during fermentation, producing large, well-risen loaves.

On the other hand, the ability of modern milling machinery to produce really white flour or, rather, flour with a pale-cream tint (dead-white flour is bleached) has raised an enormous obstacle to obtaining an adequate national menu. Perhaps one-third of that machinery works at cleaning, and — aided by roller mills that make possible almost complete separation of the oily germ — it cleans so thoroughly that only 70 to 75 per cent of the wheat berry becomes flour. With the discarded bran and germ go about one-third of the calcium, two-thirds of the iron, three-quarters of the copper, and, what is most serious from a dietary standpoint, three-quarters or more of the vitamin B_1 in the wheat. Nevertheless, the public wants white flour, as is emphasized by the reactions that greet even dictator attempts to increase the percentage of flour extracted from wheat. This prejudice against dark-colored flours (and dark-colored foods of all kinds) can be explained in part by the facts that white bread, the principal energy food, contains a good many more calories per pound than does whole-wheat bread and that, in the past, the coarse dark bread of the poor frequently contained bad grain, crushed peas and beans, sometimes even acorns. Made from flour ground between stones, such bread likely had not only a high vitamin but also a high dirt content and no doubt had to be well seasoned with hunger before it was palatable.

While the menu can make up the mineral and vitamin deficiencies of white flour by including more of the relatively expensive protective foods like milk, eggs, vegetables, and fruit, it is extremely doubtful that the average diet actually does so. In fact, the council on foods of the American Medical Association authorized the publication in December of a report by Dr. George R. Cowgill which stated in its summary that "there are grounds for believing that American dietaries as a whole are unsatisfactory with respect to the content of vitamin B_1."

More logical than supplementing white bread by increasing the intake of the protective foods seems the retaining of the natural protective factors found in wheat or the replacement of those which are removed during processing. The bakers' practice of adding dried skim milk to their formulas is a step in this direction, and another practical step (when the consumer does not insist on white flour) is to take the germ removed during milling, stabilize it against rancidity, and return it to the flour. Without this stabilizing process, the germ would rapidly spoil and produce off-flavors in the flour. Even if white flour is insisted on, there are no technical reasons why it could not have a vitamin content equivalent to that of whole grain. During the past year announcement was made of a baking yeast so high in vitamin B_1 that white bread made with it had the vitamin B_1 content of whole-wheat bread, and it is also possible to mix synthetic vitamin B_1 with flour. But, unfortunately, at their present state of development both these procedures increase bread cost, thus to a large measure barring purchase by the people who need such bread most — the poor, the ignorant, and the careless, who cannot or will not obtain enough of the usual protective foods.



Robert D. Harvey, '38

This weatherbeaten rustic windlass used in skinning beeves on a New Mexican ranch is perch for a passing bird.

Still, there are hopeful signs. From 1899 to 1935 the millers have seen per capita consumption of flour fall 30 per cent in this country. The specific cause of the decline is the world-wide tendency to eat less of cereals and more of protective foods as incomes rise. Present United States flour consumption is 155 pounds per person. England's figure is about 225 pounds, and that of France is probably much higher. How these figures would be affected if bread were also made a protective food is a matter for speculation, but that change would certainly benefit the public, and, with such a solid sales argument thrown in their laps, it is hard to see how the millers and bakers would be harmed.

Supergrid

NEWS of the low water levels in the reservoirs supplying New York City has lately been given fair newspaper prominence, with the result that readers in Middletown have had opportunity to speculate on the

possible bathlessness of Gotham and maybe to ponder on how convenient it would be if a network of pipe lines and pumping stations existed to connect the water systems of New York, Chicago, Philadelphia, Boston, St. Louis, Washington, so that by interchange the water supply of each city could be made more dependable. Absurd? Of course. Why? Too costly. There are better and more economical ways of improving dependability of supply if, indeed, any change is needed.

Analogous is the situation in the electric power field. The most recent of the acts or ideas of Federal agencies impinging on the electric power industry is the suggestion that a supergrid of extra-long high-voltage power-transmission lines be built to interconnect existing systems over distances of 1,000 miles or more. This extensive and expensive construction, its proponents hold, would aid the national defense and would render power-system operation more dependable and economical by making possible a wider interchange of electrical energy. Altogether aside from such questions as whether more or less governmental participation is desirable in business and whether deficit financing is an aid or hindrance to general industrial activity, the design, effectiveness, and cost of the supergrid offer a strictly engineering problem of considerable magnitude.

Direct-current as well as alternating-current lines have been discussed as possibilities in the proposed grids. Up to the present time, only alternating current has been used in the United States on long high-power lines. Development work on direct-current lines has been making good progress, but certainly before serious consideration can be given to a supergrid of direct-current lines, at least one preliminary long high-power line of this type will need to be built and operated so that we may know how its performance and costs are going to shape up.

The only system for which a dependable appraisal can be made at the present time is that which carries alternating current. With the usual utilization, or load, factor of 50 per cent — that is, average load equal to 50 per cent of rated capacity — the cost of transmitting large blocks of electrical energy is approximately one-tenth of a cent per kilowatt-hour per 100 miles transmitted. Generation in a good modern steam-electric power station costs approximately five-tenths of a cent per kilowatt. Thus power brought to a load center over a distance of 300 miles would be honestly competitive with locally generated power only if available for two-tenths of a cent at its source, and at 500 miles would have to be free. Highly significant is the fact that our longest line, covering slightly less than 270 miles to connect Boulder Dam and Los Angeles, secures its power from a source whose costs, in comparison to those of utilities in general, have been artificially lowered by the allocation of a large part of the cost of the dam and of land takings to uses other than power, including flood control, irrigation, and silt control, as well as by low interest rates on invested capital and virtual freedom from taxation.

Even in the face of the hard facts that money has already been spent and excess capacity already provided in certain areas, sound practice will let the excess capacity lie idle rather than attempt to utilize it more than about 350 miles away, either until the near-by load has increased enough to employ it or until transmission costs have been lowered by the further development of improved methods. Past experience points to the rapid growth of power utilization in low-cost areas; so a supergrid built to handle the large excesses of today would probably be a useless appendage in a few years — at least as a means of handling normal power flow.

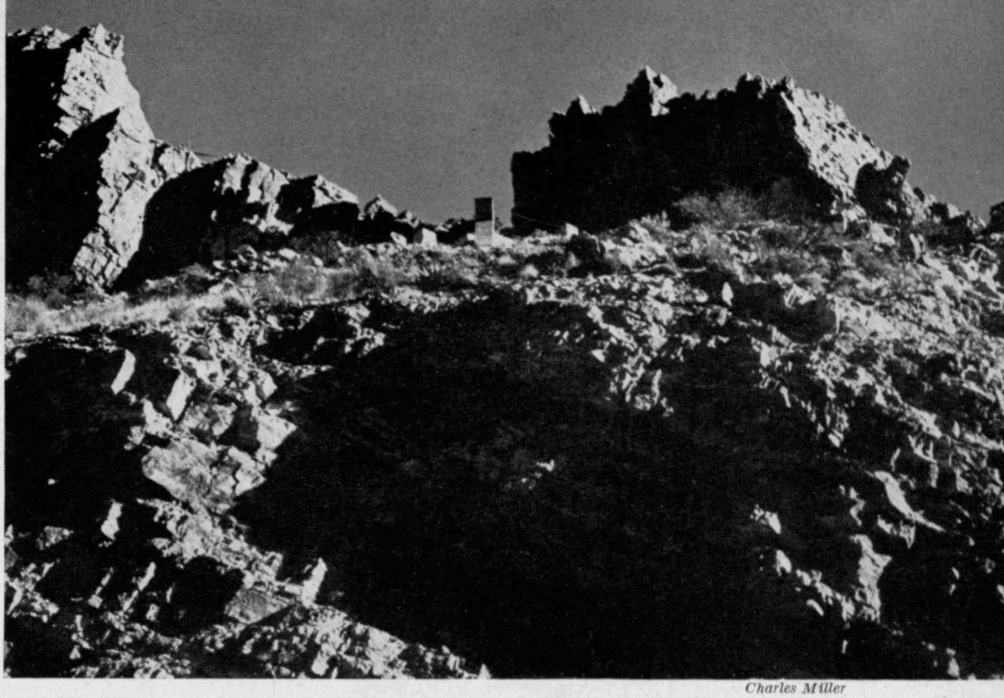
General conclusions as to the desirability or economy of stand-by lines cannot be drawn with as much definiteness as for normal-channel lines; the degree of integration and the load and generation characteristics of the various component systems must be considered in detail. However, the proposed supergrid seems to involve capital costs per kilowatt of transfer capacity equal to the cost of several kilowatts of steam-electric power-station capacity. A considerable and usually adequate amount of stand-by capacity is provided by normal advance planning and construction for future growth. In case of war, far-flung transmission systems, relatively undefended, are more easily subject to damage, especially by sabotage, than are power stations. Much of any sudden increase in demand for electrical energy due to war would be taken care of by improved load factor through the operation of factories on two and three shifts. If money is to be spent at all, the better plan — on the score of national defense — seems to be to invest it in additional steam-electric capacity in stations of moderate size, with the government perhaps contributing to the expense of constructing this capacity for more distant future use than is considered normally desirable by utility management.

In conclusion, it should be pointed out that interconnection and grids are not new ideas; that already we have not one but several comparable in extent and capacity with the British grid; and that studies of proposed interconnections have been made and continue to be made in great number by our most able system-planning engineers. When found economical, interconnections have been made and will continue to be made.

To Sun or Not to Sun

IN high latitudes, through the coastal mists, the pallid winter sun is likely to be underrated as a beneficent influence; so we may regard its presence or absence in our homes as nothing but a matter of taste. On such a strictly emotional basis, human beings seem to be about equally divided into those who like to see sunlight falling athwart their floors and those who prefer the more uniform relationships characteristic of sunless chambers. Even this division appears somewhat a matter of fashion. The parlor, the front porch, each in its day a popular adjunct of the well-turned home, have gone their way; the sun porch, often so called only by courtesy since it was frequently placed with no regard to orientation, is no longer the glamour room of the real estate advertisement, having given way to the game or rumpus room; and the sun deck seems to have died a-borning.

When fashion bids us discard a sentiment, however, science sometimes invokes it again in less emotional form. Those who worshipped sun in the house were not, it now appears, mere ritualists. The first strong argu-



Charles Müller

A skyscraper in the sky late in the afternoon. This scene by the Coolidge Dam on the Gila River near Yuma shows characteristic Arizona rock formation.

ment for sunning the dwelling stressed health — acclaiming the antirachitic properties of sunlight in addition to its pleasure-giving qualities. We had, it will be recalled, ultraviolet-transmitting glass for our windows. Not many of us had it, to be sure, for the glass was never cheap. And all too soon it was discovered that the transmissive powers of such glass were subject to premature decay. After some reaction away from the theory that sunlight in the house had anything more than a pleasure-giving value, medical science has now reinforced the argument with the impression that sunlight — even as it reaches the room through ordinary, possibly dirty, glass — has some germicidal effect and inhibits rapid bacteriological growth.

To this argument for more sun in the home is now added a vigorous economic contention. The tremendous amount of energy which the sun lavishes on the earth's surface is proverbial. At maximum intensity on a surface normal to the rays, Rowley tells us, this energy is equivalent to the heat from a blanket of 100-watt lights spaced approximately 13 inches apart. This maximum of heat energy of course does not reach very many places on the earth. The degree to which it is cut down depends on distance from the sun at the time, inclination of the rays to the plane of the horizon, transmission and absorption and reflection of the atmosphere, and other such factors. These tend to average things so that the yearly range of radiant intensity is more nearly uniform than the range of sunshine duration in hours.

Even in northern latitudes these intensities are rather astounding. In Boston in 1933, the Blue Hill Observatory found that nearly half of the potential sunshine for that latitude was received. The total radiation received that year was nearly 450,000 British thermal units per square foot of horizontal surface. On the flat-roof area of an average six-room two-story house during such a year, three times as many units of heat energy would fall as would be required for heating the building throughout that year. Even during the heating season, which is the season of low sun, nearly one and one-half times the required sunshine would be received.

This tremendous amount of wasted energy has interested architects as well as physicists and meteorologists. Thus Henry Wright found for the New York latitude that the effective solar radiation on a wall facing south is almost five times as great in the winter as in the summer; that the effective radiation on a wall facing west northwest is six times as great in the summer as in the winter; finally, that the greatest solar radiation on vertical walls occurs in the winter. From these observations he developed ideas as to economical orientation which, though widely praised, have not been widely followed. Other workers in the New York area have added that, even granting the kind of atmosphere one gets in Manhattan, a properly oriented window receives during the winter more than enough heat to compensate for the heat loss through the same glass in all the hours when the sun is, so to speak, turned off.

These facts leave us with some definite impressions. A building can be so oriented that a principal thermal advantage from winter sun is gained and the thermal disadvantage of summer sun is minimized. The principles are well known. The solar measurements have been made. Several architectural schools already have sun machines for determining exact solar conditions in any latitude and at any time (the two at the Institute are the design of Alfred L. Loomis). There then seems little excuse any longer for a badly oriented building.

In general, when humanity becomes conscious of a set of facts like these, it progresses toward its goal from two different points of view. The artist, for whom we might here read architect, attempts to express these principles by designing new forms to accord with them. Examples of this effort in contemporary architecture may be found in Henry Wright's heliothermic house, in the Suspended House and the para-solar envelope of Paul Nelson, in the canopied house of Gropius, and in the Suntop Homes of Frank Lloyd Wright. Some of these forms are likely to seem fantastic to lay people and to convention-bound fellow architects. Sometimes the idea is developed to excess as in the Zeilenbau where pursuit of sun became a fetish even to the ignoring of orientations for such other desirable elements as breeze and view. The engineer, on the other hand, is at heart conventional in his art forms, perhaps as an antidote to his daring in his own profession. He is very likely to cast his creations in the mold of the past and then be expert enough to make them work. In this success he abets conservatism. There are myriad examples of it in our architecture. One need mention nothing more than the lighting fixture.

Solar energy may be engineered into effective and economical heating systems, at least for some latitudes. In addition to utilization of (*Concluded on page 174*)

Old-timer, steam-electric, oil-electric, reciprocating steam locomotives, from left to right

General Electric

The Fastest Trains

A Survey of the Increases in Speed Over High Iron During the 1930's

By H. E. Lobdell

The first trip made by the new locomotive engine of Messrs. Laird Kitson & Co. on the North Midland Railway proved its power and speed. . . . With only a tender attached it ran *ten miles in eight minutes* between Belper and Clay Cross Tunnel, being at the rate of *seventy-five miles per hour.* — *The Railway Times* (London), June, 1840.

RAPID movement over high iron has provided abundant cause for debate ever since railroading began. Like the weather, the speed of trains is a nearly ideal conversational topic — perennially fertile in pros and cons, and ever refreshed by reports of further observations. Hence, last summer when a train on the Hamburg-Berlin run averaged 124 miles an hour and reached 133 miles an hour, which speed it held for as long as 25 minutes at a time, the Reichsbahn very proudly announced its appropriation of one of the world's blue ribands.

This new record must have given many Germans a thrill, but the published timetables of the Reichsbahn contained information which was of more immediate consequence — at least until September. For instance, it contained assurance to a resident of Berlin that the Diesel-powered *Fliegende Hamburger* would haul him in either direction over the 178 miles separating Berlin and Hamburg on any day, Sunday excepted, at an average speed of 76.3 miles an hour; or that he could go by the steam-powered *FD 24* at an average of 71.7 and come home by the *FD 23* at 70.7. To Leipzig (102 miles) he had a choice of several scheduled trains — including the *Fliegende Münchener* — averaging as high as 79.6; to Hannover (157 miles), a choice of several averaging as high as 75.7; to Breslau (205 miles), at least one at 76.3; to Cologne (367 miles) the *Fliegende Kölner* would average 70.9 and would exceed 80 miles an hour for the 110 miles between Hannover and Hamm.

All these fast German services had become available within a half dozen years. For that matter, as recently as 1932 there had been but one train in all the world booked to better 70: the Great Western's *Cheltenham Flyer*, which then covered the 77.3 miles between Swindon and Paddington Station, London, in 65 minutes, or at a rate of 71.4 miles an hour. By 1938 — the last year for which computations have been completed — trains at speeds in excess of 70 miles an hour from start to stop were scheduled to be run over a total world mileage of 10,169. German railways accounted for 3,043 (30 per cent) of this total; French, for 1,850 (18.2 per cent); British, for 730 (7.2 per cent); Italian, for 131 (1.2 per cent). The remaining 4,415 miles (43.4 per cent) were in the United States.

When a new record is established by a particular train on a particular occasion, the event is usually newsworthy, especially if the performance portends further improvements in regular services. Back in 1905 "Death Valley Scotty," a desert character by no means averse to public notice, made front pages by hiring a special train on which he had a rough and decidedly uncomfortable ride from Los Angeles to Chicago in the remarkable time of 6 minutes less than 45 hours. His achievement, unrivaled for almost twenty years, stood until March, 1924, when the wife of a railroad president, by a combination of two specials, set a Los Angeles to New York record of 69 hours 7 minutes. Her record lasted eleven and a half years, being upset in October, 1934, when the streamliner *City of Portland*, on a test run, reduced it to 59 hours 55 minutes.

Nowadays anybody in Los Angeles, with the price of a ticket, can board the Union Pacific's *City of Los Angeles*, or the *Super Chief* or *El Capitan* of the Santa Fe, and beat Scotty's record to Chicago by more than five hours. If he arrives on the *City of Los Angeles*, he can partake of a leisurely luncheon in Chicago while deciding which of eight trains he prefers to ride to New York in order to complete the transcontinental journey in eight to ten hours less than it took the railroad president's wife. The eight trains are the *Commodore Vanderbilt*, *Pacemaker*, *Water Level Ltd.*, and *20th Century Ltd.* of the New York Central; the *Golden Arrow*, *Trail Blazer*, *General*, and *Broadway Ltd.* of the Pennsylvania. Using the *Super Chief* out of Los Angeles, he can also continue eastward from Chicago by any of these eight trains and cut the lady's time by from nine and a half to twelve hours. Since Chicago connections with the *Pacemaker*, *Golden Arrow*, or *Trail Blazer* would be close, he should lunch on the *Super Chief*.

By thirteen of the foregoing sixteen combinations a traveler would get from Los Angeles to New York in less time than the record made in 1934 by the *City*

TABLE 1: FIVE-YEAR ADVANCE (1933–1938) IN AGGREGATE TRAIN MILEAGES BOOKED TO OPERATE FROM START TO STOP AT 60 MILES AN HOUR AND OVER

(Based upon data compiled by the *Railway Gazette*, London)

	Power	United States	Great Britain	France	Germany	Italy	Holland	Other Countries	World Total
1938	Steam	23,692	11,665	6,074	4,360	205	.....	637	46,633
	Diesel	14,840	.....	6,343	4,787	1,146	1,949	1,878	30,943
	Electric	9,632	.....	2,177	1,089	774	1,914	150	15,736
	Total	48,164	11,665	14,594	10,236	2,125	3,863	2,665	93,312
1933	Total	2,022[1]	2,375	5,462	712	.....[2]	.....[2]	.....[2]	10,571[3]
	Increase	46,142	9,290	9,132	9,524	2,125[2]	3,863[2]	2,665[2]	82,741

[1] 1932 figures
[2] Data unavailable or incomplete
[3] Includes mileage for only the United States, Great Britain, France, and Germany

of Portland; and by two (*Super Chief* with *Pacemaker* or *Golden Arrow*), the time would be about two hours less. To evidences of marked upward trends in the speeds afforded by ordinary passenger services the American public rightfully attaches greater significance than to new records made by specials or to bursts of acceleration over comparatively short straightaway stretches. Sustained speeds between terminals, figured without deduction of time for intermediate stoppages, are what count. Nine years ago The Review published a compilation of speed trends over a 20-year period (1910–1930), in which were given the times, distances, and average speeds maintained on thirty representative fast American and Canadian runs aggregating a mileage of over 30,000. In revision of that compilation (see Table 2 on pages 150 and 151) so that it covers a 30-year period (1910–1940), the Denver-Chicago service, which is now nearer representative, has been substituted for the Chicago-Jacksonville run previously used. It will be observed that the thirty runs included in the compilation range from the 227-mile New York-Washington service to that of 2,929 miles between Montreal and Vancouver. They divide into groups according to their mileage: A third vary between 200 and 475; about a third, between 475 and 1,000; five are between 1,000 and 1,200; and six are over 2,000.

A summation of the hours and mileages of the speediest trains on each of the thirty individual runs at the beginning of the 1940's indicates a combined average of 48.1 miles an hour, an advance of 7 miles an hour over the 41.11 average of 1930. For 1920 the corresponding figure was 34.25; for 1910, it was 34.77. Similar summations for the subdivisions mentioned above show the decline in average maintained speeds between 1910 and 1920, except for the longest runs; the rise between 1920 and 1930; and the further rise between 1930 and 1940:

Group	Number of Runs	1940	1930	1920	1910
200–475 miles.....	10	55.6	47.2	40.5	42.3
475–1,000.....	9	46.1	41.8	35.5	36.5
1,000–1,200.....	5	55.5	46.1	41.3	45.2
Over 2,000.....	6	45.1	37.8	30.5	29.9

For many of the trains listed in Table 2 a detailed examination of their schedules between *intermediate* terminals corroborates the impression that sustained speeds in excess of the traditionally rapid mile a minute are no longer exceptional. For example, Santa Fe's *Super Chief*, which averages 56.0 miles an hour between Chicago and Los Angeles (2,227 miles), betters 60 from Chicago to Newton, Kansas (636 miles), and betters 70 from Newton to La Junta, Colo. (356 miles). West of La Junta curvatures, grades, and other factors combine to lower its average below 60.

Upon a "breakdown" basis in this fashion it has been figured that during the five-year period 1933 to 1938, the world's aggregate train mileages booked to operate from start to stop at 60 miles an hour or more increased *ninefold*, from 10,571 to the astonishing total of 93,312. For the United States alone they expanded nearly twenty-fourfold—from 2,022 to 48,164—during the period.

The prominence of Diesel trains in current timetables is reflected in Table 1 (above), which was prepared upon the basis of data published last year in the *Railway Gazette* of London to illustrate the gain in high-speed mileages referred to above. Diesel as a prime mover on railways was practically unknown in 1933 except for switching or in single-car services on branch lines. By 1938 it accounted for a third of the world's train mileages booked to operate from start to stop at 60 or over, and for 31 per cent of the train mileages in the United States. Half of the world's train mileages booked at 60 or over continued to depend upon steam in 1938 and 17 per cent upon electricity, the corresponding percentages for the United States in that year being 49 and 20.

Burlington's *Pioneer Zephyr* became the first Diesel train to enter revenue passenger service upon an American railroad when it made its initial trip between Kansas City, Omaha, and Lincoln on November 11, 1934. The subsequent development and extending usage of this type of motive power have been truly remarkable; the Diesel has exerted a profound influence upon the quickening of American railway services. It would be incorrect, however, to credit the Diesel with having made the higher average speeds possible. Both steam and electricity had long been capable of more speed than railways

(*Concluded on page 163*)

Henry C. Mable, '36

Table 2: Representative Fast Railroad Runs Between Metropolitan Centers in the United States and Canada

(Figures after names of trains indicate hours, mileage, and average speed, respectively. Example: The present schedule of Pennsylvania's *Congressional* from New York to Washington in 3.6 hours over a distance of 227 miles is at an average of **63.0** miles an hour.)

Number of Run	Terminals of Run	Railroad	1940		1930		1920		1910		Number of Run
1	New York-Washington	Pennsylvania	*Congressional*	3.6 – 227–**63.0**	*Congressional Ltd.*	4.5 – 226–**50.2**	*Congressional Ltd.*	5.1 – 226–**44.4**	*Congressional Ltd.*	5.0 – 226–**45.2**	1
2	Boston-New York	N.Y. N.H. & H.	*Yankee Clipper* [1]	4.5 – 229–**50.9**	*Yankee Clipper*	4.75– 229–**48.2**	*Merchants Ltd.*	5.2 – 229–**44.1**	*Merchants Ltd.*	5.0 – 233–**46.6**	2
3	Chicago-St. Louis	Illinois Central	*Green Diamond*	4.9 – 294–**60.0**	*Michigan Boulevard*	6.5 – 294–**45.3**	*Daylight Special*	8.0 – 294–**36.8**	*Daylight Special*	8.0 – 293–**36.7**	3
		Chi. & E. Illinois	*Zipper*	4.9 – 290–**59.2**	*La Salle*	6.5 – 290–**44.6**	*Chi.-St. Louis Ltd.*	7.8 – 290–**37.2**	*St. Louis Ltd.*	8.0 – 290–**36.3**	
		Wabash	*Blue Bird*	5.2 – 286–**55.0**	*Banner Blue Ltd.*	6.5 – 286–**44.0**	*Banner Ltd.*	7.8 – 286–**36.7**	*Banner Ltd.*	8.0 – 286–**35.8**	
		Chicago & Alton	*Abraham Lincoln*	4.9 – 284–**58.0**	*Alton Ltd.*	6.5 – 284–**43.7**	*Alton Ltd.*	7.75– 284–**36.7**	*Alton Ltd.*	8.0 – 284–**35.5**	
4	Toronto-Montreal	Canadian National [2]	*Inter-City Ltd.* [3]	6.5 – 334–**51.3**	*Inter-City Ltd.*	6.0 – 334–**55.6**	*International Ltd.*	7.7 – 334–**43.4**	*International Ltd.*	7.5 – 334–**44.5**	4
5	Chicago-St. Paul	C. B. & Q.	*Morning Zephyr*	6.25– 431–**68.9**	*North Coast Ltd.*	9.8 – 431–**44.0**	*North Coast Ltd.*	12.9 – 431–**33.4**	*Oriental Ltd.*	12.3 – 431–**35.0**	5
		C. M. St.P. & P. [4]	*Afternoon Hiawatha*	6.5 – 410–**63.1**	*Olympian*	9.8 – 410–**41.8**	*Olympian*	12.4 – 410–**33.1**	*St. Paul-Minneapolis Special*	11.7 – 410–**35.0**	
		Chi. & N.W.	*The "400"*	6.5 – 396–**60.9**	*Victory*	9.8 – 396–**40.4**	*North American*	12.8 – 411–**32.1**	*St. Paul and Minneapolis Express*	10.8 – 412–**38.2**	
6	New York-Buffalo	New York Central	*Empire State Exp.*	7.75– 436–**56.3**	*Empire State Exp.*	8.5 – 436–**51.3**	*Empire State Exp.*	9.0 – 439–**48.8**	*Empire State Exp.*	8.75– 443–**50.6**	6
7	New York-Pittsburgh	Pennsylvania	*Broadway Ltd.*	8.0 – 440–**55.0**	*Spirit of St. Louis*	9.4 – 440–**46.8**	*Broadway Ltd.*	9.6 – 441–**45.9**	*Pennsylvania Spec.*	8.75– 439–**50.2**	7
8	Boston-Washington	N.Y. N.H. & H., Pennsylvania	*Senator*	9.0 – 458–**50.9**	*Senator*	9.5 – 458–**48.2**	*Colonial Express*	11.75– 458–**38.1**	*Colonial Express*	12.7 – 444–**35.7**	8
9	Chicago-Pittsburgh	Pennsylvania	*Broadway Ltd.*	7.9 – 468–**59.2**	*Liberty Ltd.*	9.7 – 468–**48.3**	*Broadway Ltd.*	10.3 – 468–**45.5**	*Pennsylvania Spec.*	9.1 – 468–**51.4**	9
10	San Francisco-Los Angeles	Southern Pacific	*Daylight*	9.75– 470–**48.2**	*Daylight*	11.75– 471–**40.1**	*Lark*	14.25– 475–**33.3**	*Shore Line Ltd.*	13.5 – 475–**35.2**	10
11	Cincinnati-Atlanta	Louisville & Nashville	*Southland*	11.6 – 489–**42.1**	*Southland*	12.8 – 488–**38.1**	*Southland*	15.0 – 488–**32.5**	Number 33	14.0 – 487–**34.8**	11
		Southern	*Royal Palm*	12.5 – 491–**39.3**	*Royal Palm*	12.8 – 491–**38.3**	*Royal Palm*	17.25– 493–**28.6**	*Florida Special*	15.0 – 494–**32.9**	
12	Washington-Atlanta	Southern	*Crescent*	14.8 – 638–**43.1**	*Crescent Ltd.*	16.25– 638–**39.3**	*N.Y. & New Orleans Ltd.*	20.5 – 649–**31.6**	*N.Y. & New Orleans Ltd.*	19.25– 649–**33.7**	12
13	Portland-San Francisco	Southern Pacific	*Cascade*	19.5 – 725–**37.2**	*Cascade*	21.2 – 721–**34.0**	*Oregonian*	32.8 – 745–**22.7**	*Shasta Ltd.*	27.5 – 745–**27.1**	13
14	St. Louis-Dallas	Mo.-Kan.-Texas	*Texas Special*	16.0 – 767–**47.9**	*Texas Special*	17.9 – 767–**42.8**	*Texas Special*	19.25– 767–**39.8**	*Katy Ltd.*	23.2 – 767–**33.1**	14
		Missouri Pacific	*Sunshine Special*	16.0 – 711–**44.4**	*Sunshine Special*	17.9 – 711–**39.7**	*Sunshine Special*	19.1 – 707–**36.3**	Number 3	23.0 – 708–**30.8**	
		St. Louis-San Francisco	*Texas Special*	16.0 – 689–**43.0**	*Texas Special*	17.8 – 688–**38.6**	*Texas Special*	19.25– 688–**35.7**	Number 6	22.6 – 684–**30.3**	
15	Washington-Chicago	Pennsylvania	*Liberty Ltd.*	16.4 – 836–**51.0**	*Liberty Ltd.*	18.75– 836–**44.6**	*Broadway Ltd.*	19.75– 837–**42.3**	*Pennsylvania Spec.*	18.25– 837–**45.8**	15
		B. & O.	*Capitol Ltd.*	15.7 – 772–**49.1**	*Capitol Ltd.*	18.75– 786–**41.9**	*N. Y.-Chicago Ltd.*	20.7 – 779–**37.7**	*Chicago Ltd.*	21.3 – 820–**38.5**	
16	Montreal-Chicago	Canadian National [2]	*International Ltd.*	17.75– 849–**47.8**	*International Ltd.*	18.25– 848–**46.5**	*International Ltd.*	23.3 – 841–**36.1**	*International Ltd.*	23.7 – 842–**35.5**	16

17	Cincinnati-New Orleans	Louisville & Nashville	*Pan-American*	22.1 – 922–**41.7**	*Pan-American*	23.75– 921–**38.8**	*New Orleans Ltd.*	28.2 – 923–**32.7**	Number 1	26.5 – 923–**34.8**	17
		Southern [5]	*Queen and Crescent Ltd.*	23.0 – 836–**36.3**	*Queen and Crescent Ltd.*	23.4 – 836–**35.7**	*New Orleans Ltd.*	27.8 – 837–**30.2**			
18	Chicago-New Orleans	Illinois Central	*Panama Ltd.*	20.0 – 921–**46.0**	*Panama Ltd.*	21.0 – 921–**43.8**	*Panama Ltd.*	22.75– 921–**40.5**	*New Orleans Spec.*	25.25– 921–**36.5**	18
19	New York-Chicago	New York Central	*20th Century Ltd.*	16.0 – 961–**60.0**	*20th Century Ltd.*	20.0 – 961–**48.0**	*20th Century Ltd.*	20.0 – 979–**48.9**	*20th Century Ltd.*	18.0 – 983–**54.6**	19
		Pennsylvania	*Broadway Ltd.*	16.0 – 908–**56.8**	*Broadway Ltd.*	20.0 – 908–**45.4**	*Broadway Ltd.*	20.0 – 909–**45.4**	*Pennsylvania Spec.*	18.0 – 909–**50.2**	
20	Boston-Chicago	B. & A., N.Y.C.	*New England States*	19.0 –1019–**53.6**	*20th Century Ltd.*	22.25–1019–**45.8**	*20th Century Ltd.*	22.25–1038–**46.5**	*20th Century Ltd.*	20.5 –1043–**50.9**	20
21	New York-Jacksonville	Atlantic Coast Line	*The Champion*	18.25–1021–**56.0**	*Havana Special*	22.5 –1021–**45.4**	*Florida Special*	27.0 –1021–**37.8**	*N.Y. and Florida Spec.*	24.8 –1018–**40.1**	21
		Seaboard	*Silver Meteor*	18.6 – 983–**52.8**	*So. States Special*	25.75– 982–**38.2**	*Seaboard Florida Ltd.*	27.5 – 982–**35.7**	*Seaboard Florida Ltd.*	24.8 – 982–**39.6**	
22	Denver-Chicago	Union Pacific	*City of Denver*	15.6 –1048–**67.2**	*Denver Special*	24.75–1048–**42.4**	*Denver Special*	28.0 –1052–**37.6**	*Denver Special*	27.0 –1060–**39.3**	22
		C. B. & Q.	*Denver Zephyr*	15.6 –1034–**66.3**	*Denver Ltd.*	24.75–1034–**41.8**	*Denver Ltd.*	28.5 –1034–**36.3**	*Chicago Ltd.*	27.5 –1034–**37.6**	
23	New York-St. Louis	New York Central	*Knickerbocker*	21.3 –1158–**54.3**	*Southwestern Ltd.*	23.0 –1156–**50.2**	*Southwestern Ltd.*	26.6 –1158–**43.5**	*Southwestern Ltd.*	24.0 –1175–**49.0**	23
		Pennsylvania	*Spirit of St. Louis*	20.0 –1051–**52.6**	*Spirit of St. Louis*	23.0 –1052–**45.7**	*St. Louisan*	24.8 –1053–**42.5**	*24-Hour St. Louis*	24.0 –1060–**44.2**	
24	Boston-St. Louis	B. & A., N.Y.C.	*Southwestern Ltd.*	24.3 –1216–**50.0**	*Southwestern Ltd.*	25.8 –1215–**47.1**	*Southwestern Ltd.*	29.1 –1216–**41.8**	*N.Y. Central Ltd.*	26.1 –1235–**47.3**	24
25	New Orleans-Los Angeles	Southern Pacific	*Sunset Ltd.*	53.75–2007–**37.3**	*Sunset Ltd.*	56.3 –2008–**35.6**	*Sunset Ltd.*	62.5 –2003–**32.5**	Number 9	75.6 –2003–**26.9**	25
26	Chicago-Los Angeles	Union Pacific	*City of Los Angeles*	39.75–2299–**57.8**	*Los Angeles Ltd.*	61.0 –2299–**37.7**	*Overland Ltd.*	72.2 –2301–**31.9**	*Los Angeles Ltd.*	72.0 –2310–**32.1**	26
		Santa Fe	*Super Chief*	39.75–2227–**56.0**	*Chief*	56.0 –2228–**39.8**	*California Ltd.*	71.5 –2231–**31.2**	*California Ltd.*	72.0 –2267–**31.5**	
		C. R.I. & P., So. Pacific	*Golden State Ltd.*	58.8 –2274–**38.7**	*Golden State Ltd.*	61.0 –2281–**37.4**	*Golden State Ltd.*	73.5 –2276–**31.0**	*California Special*	72.0 –2275–**31.6**	
27	Chicago-San Francisco	C. & N.W., U.P., So. Pacific	*City of San Francisco*	39.6 –2261–**57.1**	*Overland Ltd.*	56.0 –2261–**40.9**	*Overland Ltd.*	72.0 –2264–**31.4**	*China & Japan Fast Mail*	66.5 –2278–**34.3**	27
28	Portland-Chicago	Union Pacific	*City of Portland*	39.75–2272–**57.2**	*Portland Rose*	57.5 –2272–**39.5**	*Oregon-Wash. Ltd.*	72.0 –2266–**31.5**	*Oregon-Wash. Ltd.*	72.0 –2291–**31.9**	28
		Northern Pacific	*North Coast Ltd.*	57.25–2322–**40.6**	*North Coast Ltd.*	57.5 –2316–**40.3**	*North Coast Ltd.*	72.0 –2312–**32.1**	*Northern Pacific Express*	72.0 –2319–**32.4**	
		Great Northern	*Empire Builder*	57.2 –2317–**40.5**	*Empire Builder*	57.25–2245–**39.2**	*Oriental Ltd.*	72.0 –2243–**31.2**	*Oriental Ltd.*	72.0 –2294–**31.9**	
29	Seattle-Chicago [6]	Northern Pacific	*North Coast Ltd.*	57.25–2344–**40.9**	*North Coast Ltd.*	58.5 –2335–**39.9**	*North Coast Ltd.*	73.2 –2335–**31.9**	*Northern Pacific Express*	74.25–2342–**31.5**	29
		Great Northern	*Empire Builder*	56.4 –2268–**40.2**	*Empire Builder*	57.25–2196–**38.4**	*Oriental Ltd.*	72.0 –2206–**30.6**	*Oriental Ltd.*	72.0 –2256–**31.3**	
		C. M. St.P. & P. [4, 7]	*Olympian*	56.6 –2188–**38.6**	*Olympian*	58.0 –2188–**37.7**	*Olympian*	72.0 –2190–**30.4**			
30	Montreal-Vancouver	Canadian National	*Continental Ltd.*	82.6 –2929–**35.5**							
		Canadian Pacific	*Dominion*	83.1 –2882–**34.7**	*Trans-Canada Ltd.* [8]	86.25–2886–**33.5**	*Imperial*	111.25–2886–**25.9**	*Pacific Express*	112.5 –2897–**25.8**	30
					Imperial	98.75–2886–**29.2**					
Total times and mileages of fastest trains on each run				**633.45 hours—30,469 miles**		**739.15 hours—30,384 miles**		**891.25 hours—30,527 miles**		**880.0 hours—30,601 miles**	
Average speed maintained by thirty fastest trains				**48.10 miles an hour**		**41.11 miles an hour**		**34.25 miles an hour**		**34.77 miles an hour**	

[1] When two or more trains of same railroad maintain schedule listed in the table, the name of but one appears. Example: N.Y. N.H. & H. has two 4.5-hour trains between Boston and New York, *Yankee Clipper* and *Merchants Ltd.*

[2] In 1920 and 1910 this part of present Canadian National was part of Grand Trunk Railway System.

[3] *Inter-City Ltd.* maintains schedule shown eastbound only; *International Ltd.* maintains it westbound.

[4] The present Chicago, Milwaukee, St. Paul and Pacific was the Chicago, Milwaukee and St. Paul in 1920 and 1910.

[5] In 1910 the Southern maintained no through Cincinnati-New Orleans service.

[6] If schedules in opposite directions differ, the faster is listed in the table. Examples: *North Coast Ltd.* now has a schedule of 57.25 hours eastbound Seattle to Chicago and 58.8 hours westbound; *Empire Builder's* schedule between same points is 56.4 hours eastbound and 58.75 hours westbound; *Olympian's* schedule is 56.6 hours eastbound and 58.75 hours westbound. Such differences are usually to permit arrivals at intermediate terminals of importance and convenient connections with other trains.

[7] In 1910 the Chicago, Milwaukee and St. Paul maintained no through Seattle-Chicago service.

[8] *Trans-Canada Ltd.* — summer train only.

If War Comes

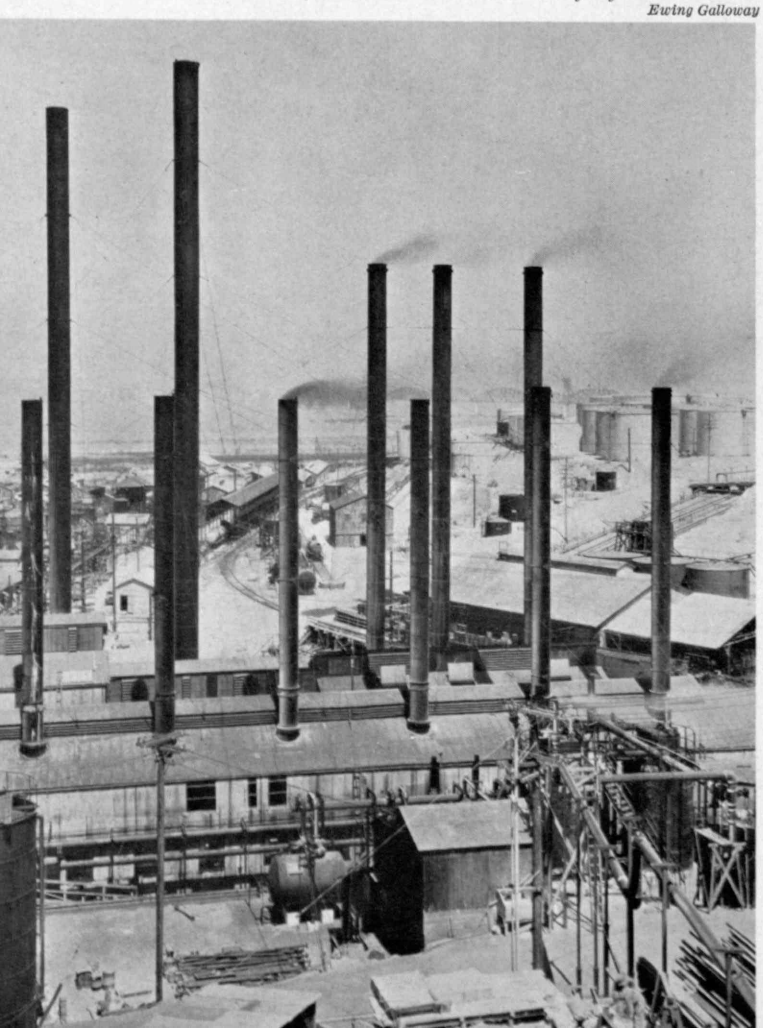
Materials Are Classified and Manufacturing Tactics Mapped in Government Programs to Meet an Emergency; How Industry Will Be Affected

By Clark S. Robinson

THE *opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the War Department or the Army at large.*

IN 1916, Congress passed the National Defense Act, which, amended a number of times since then, is now the basis for all our war planning. The act is designed so to prepare the United States that if it be plunged into war at any time, less time and money will be wasted in putting the country on a wartime basis. No one wants war to come to this country, but there is always the possibility that it may. The people of the United States hence should have some acquaintance with this law as well as with the additional legislation which will be required to complete the government's control of all activities affecting the prosecution of a war. Here are some of the pertinent passages from section 120 of the National Defense Act, which will summarize the principal elements of the plan:

Factory smokestacks share the task of defense
Ewing Galloway



The President, in time of war or when war is imminent, is empowered, through the head of any department of the Government, in addition to the present authorized methods of purchase or procurement, to place an order with any individual, firm, association, company, corporation, or organized manufacturing industry for such product or material as may be required, and which is of the nature and kind usually produced . . . by such individual . . . or organized manufacturing industry.

Compliance with all such orders for products or material shall be obligatory on any individual . . . or industry or the responsible head or heads thereof and shall take precedence over all other orders and contracts theretofore placed with such individual . . . or industry, and any individual, firm, or . . . industry or the responsible head . . . thereof owning or operating any plant equipped for the manufacture of . . . any necessary supplies . . . for the Army, and any individual, firm . . . or industry . . . owning or operating any manufacturing plant, which, in the opinion of the Secretary of War shall be capable of being readily transformed into a plant for the manufacture of . . . necessary supplies . . . who shall refuse to give to the United States such preference . . . or who shall refuse to furnish such . . . supplies . . . at a reasonable price as determined by the Secretary of War, then . . . the President . . . is hereby authorized to take immediate possession of any such plant . . . and the responsible head or heads thereof . . . shall be deemed guilty of a felony. . . .

The compensation to be paid any . . . company . . . for its products . . . or as rental for use of any manufacturing plant while used by the United States, shall be fair and just. The Secretary of War shall also . . . cause to be made a complete list of all privately owned plants in the United States equipped to manufacture arms or ammunition, or the component parts thereof. He shall obtain . . . complete information regarding the . . . equipment in each plant, and the maximum capacity thereof.

Construing this law, the courts have ruled that this section imposes a duty on a manufacturer to comply with an order of the United States for war supplies, although the order may prevent him from carrying out earlier contracts into which he has entered with private persons.

The late William Jennings Bryan is often quoted as having said that when war comes to this country, a million men will spring to arms overnight. There seems to be little doubt that such a happening could be approximated, provided the arms were there to which they could spring. But modern warfare requires highly elaborate equipment, of which very little is kept on hand by this country, and to provide which demands a great deal of time — months for some of it and years for

the rest. The object of the government's plans is to make this period as short as possible and to do so in such a way that its cost to the country in money and in disarrangement of ordinary activities will be as small as possible. The government's requirements in time of war are enormous. During the World War, this country purchased for its Army and Navy approximately 600,000 different items, if various sizes of things like nuts and bolts are counted as different items. In planning for the next war, authorities have ticketed 7,300 items as of such importance that special arrangements will have to be made to insure an adequate supply.

Included among the 7,300 items are three classes of materials: the strategic, the critical, and the essential materials which are neither strategic nor critical. Strategic materials are defined as those which come mostly from overseas and the withholding of which, as by a blockade, would seriously affect the national defense. Critical materials are those which are produced in this country but in amounts insufficient for war and civil purposes combined, so that special arrangements, including restrictions on civil use, would have to be made to procure enough of them for military use. Essential materials include the rest of the 7,300 items.

Supplies needed by the Army and Navy consist mostly of manufactured goods, raw materials for which compose the entire list of strategic items. This list is changed from time to time as the requirements of the Army and Navy change and as substitute materials become available in adequate commercial quantities. The 1939 list includes aluminum, antimony, chromium, coconut-shell charcoal, ferromanganese, Manila fiber, mercury, mica, nickel, optical glass, quartz crystals, quinine, rubber, silk, tin, tungsten, and wool. The reasons why these substances are called strategic vary with the substance, as a survey of the list will show.

Aluminum is made from high-grade bauxite ores, over 50 per cent of which are imported. Limited fabrication facilities for special shaping and limited electric furnace and power facilities contribute to the possibility of shortage. Antimony, required in type metal, bearings, hard lead, storage batteries, and in many chemical industries, comes chiefly from China, with Mexico another large contributor. Chromium, the ores of which come chiefly from Asia, with Africa a poor second, is widely used in stainless steels, chrome-steel alloys, armor plate, projectiles, spring steel, cutting tools, and to a very great extent in refractories. Coconut shells for the manufacture of charcoal for gas masks come almost exclusively from the Far East, including the Philippines.

It is practically impossible to make steel without manganese, all the high-grade ores of which are imported from remote countries — Russia, India, Africa, and Brazil — although Cuba produces some. This country has low-grade ores which could be used, but only at considerably increased expense. No Manila fiber is produced in this country. If the Philippine Islands, commercial source of the fiber, were cut off, it could be grown in tropical America. Manila fiber is used in practically all naval cordage because it floats and because it resists the action of salt water. The automobile, airplane, and radio industries depend on mica as an electric insulator. Mica is a widely found material, but the necessary sheet form comes principally from India. On this account there is great interest, even at the present time, in suitable substitutes. A synthetic mica, made from bentonite clay, is being developed at the Institute.

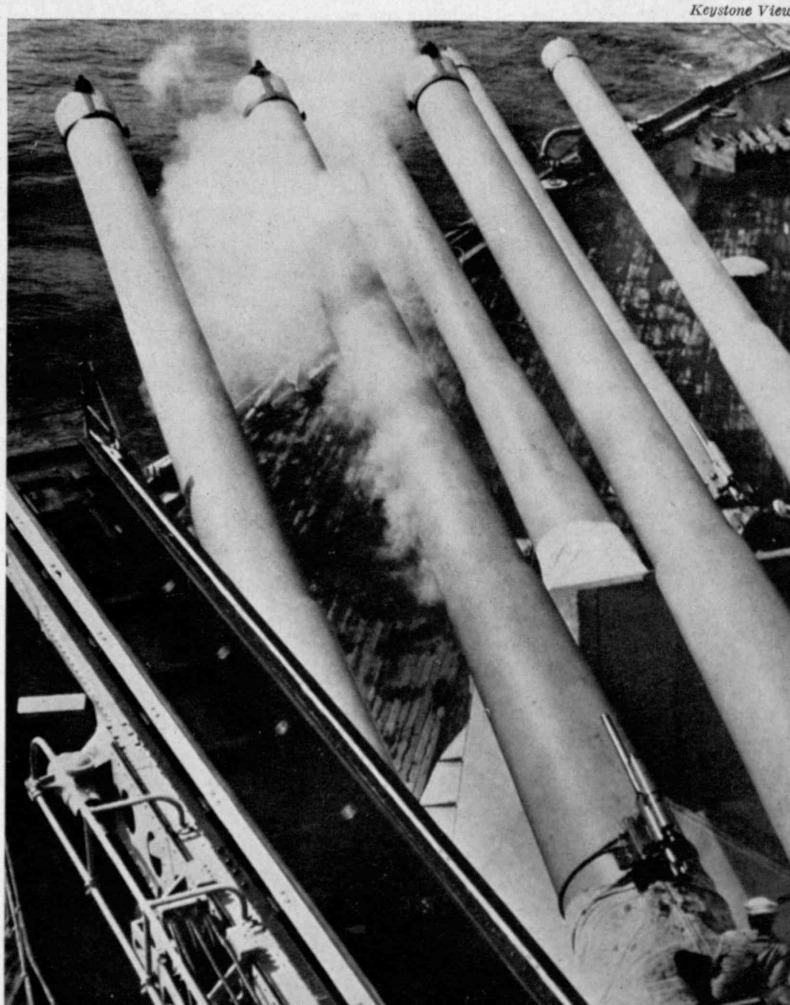
Nickel is used to toughen steel, all nations relying on nickel steel for armor plate. About one-third of our consumption of nickel is used in steel alloys, one-third in anodes, and one-third in nickel plating and in nonferrous alloys such as Monel metal. Most of our supply comes from Canada, the rest chiefly from New Caledonia in the Far East. Though it is unlikely that our Canadian sources would be cut off by blockade, the demands of the British Empire might appreciably reduce our supply.

During the World War the optical-glass industry was developed in the United States, so that by the end of the war there was ample capacity. Since that time, however, all but one of the larger plants have been dismantled on account of foreign competition, and it will take a long time to get into production again, the mere aging and curing of the kaolin pots for the melted glass requiring eight months. Quartz crystals are needed for optical instruments and radio equipment, the best source of crystals for radio frequency control being Brazil.

The Dutch East Indies furnish 90 per cent of the world's supply of quinine, which is employed chiefly in the treatment of malaria and has other medicinal uses. No substitutes for quinine have been developed, although certain other substances can be used to complement it. This country uses each year about one billion pounds of crude rubber, practically all of which comes from the East Indies. (*Continued on page 164*)

Fourteen-inch guns of the U.S.S. California

Keystone View



H. J. Rugo, '37

The Rogers Building — School of Architecture

The Graduate School of M.I.T.

Provision for Advanced Study Dates from Earliest Years in Institute History

By Harry M. Goodwin

THE Graduate School of M.I.T. was organized as a separate administrative unit in 1932 upon the recommendation of a special faculty committee appointed by President Compton to study the general problem of postgraduate instruction, the importance of which he had stressed in his first report to the Corporation in 1931. The number of students registered for graduate work in 1931–1932 had reached 578, and approximately one-third of all degrees conferred annually were to candidates for masterate or doctorate. Recognition of the place which graduate study and research had assumed in the Institute's educational program was the logical sequel to a development which had been taking place for many years.

That President Rogers and his Corporation and Faculty hoped to see Institute instruction include postgraduate study leading to the doctor's degree is evident from a vote of the Corporation, June 13, 1872, "to establish advanced courses of study and to confer the degree of doctor of science." The requirement for admission to postgraduate work was the bachelor of science degree of the Institute or the passing of such examinations as would indicate that the applicant was qualified to take this degree. A printed thesis was required, as was a minimum residence of two years. To encourage students to return for graduate work, five "advanced scholarships" of $150 each, equivalent to full tuition at that time, were to be awarded by the Corporation upon the recommendation of the Faculty. That the inclusion of graduate work in Institute activities was considered important is further indicated by the gift in 1873 of $10,000 from James Savage, President Rogers' father-in-law, to endow a scholarship "for a graduate student of the Institute or some similar institution of equal standing, who wishes to engage in advanced study of some branch or branches of knowledge taught at the Institute." Graduate scholarships covering free tuition did not, however, offer a sufficient inducement for students to return for further study after receiving their bachelor's degrees. Graduates of the engineering courses were in great demand at that time and graduates in science, if they considered following academic careers, usually continued their studies for the doctor's degree abroad or, in some cases, at the recently founded Johns Hopkins University.

In the catalogue for 1884–1885, we find further inducements to return for graduate work, namely, the degree of master of science awarded after one year of graduate study and the degree of doctor of philosophy or doctor of science, after a minimum of two years' resident work. This announcement brought results, as one graduate in Chemistry — Frederick Fox, Jr., '85 — returned for a fifth year of advanced study and in 1886 received the first degree of master of science in Chemistry; the following year, Arthur A. Noyes, '86, also a graduate in Chemistry, returned to receive his master's degree. The Institute thus entered the ranks of institutions conferring higher degrees. In 1888, a second bequest of $10,000 was received, this one from the estate of Susan H. Swett, the income to be used to assist graduate students.

Although the number of students returning for postgraduate work was so limited, President Walker pointed out with satisfaction in his 1887 report that twenty-three students holding bachelor's degrees (twenty-one from colleges other than M.I.T.) had registered. These "graduate" students were, however, all pursuing regular undergraduate courses leading to the degree of bachelor of science. A special effort seems to have been made at that time to attract graduate students in Architecture, as more master's degrees were conferred in that School during the Nineties than in any other.

It would be wrong to conclude that, because few students returned for postgraduate study, research in science and engineering was neglected or regarded as an unessential part of the work of the Institute during these early years. When Edward C. Pickering resigned in 1877, after ten years of service as head of the Department of Physics, to become director of the Harvard College Observatory, he cited in his final report eleven published and ten unpublished papers embodying the results of research done under his direction in the physical laboratory. Similar research activity could be

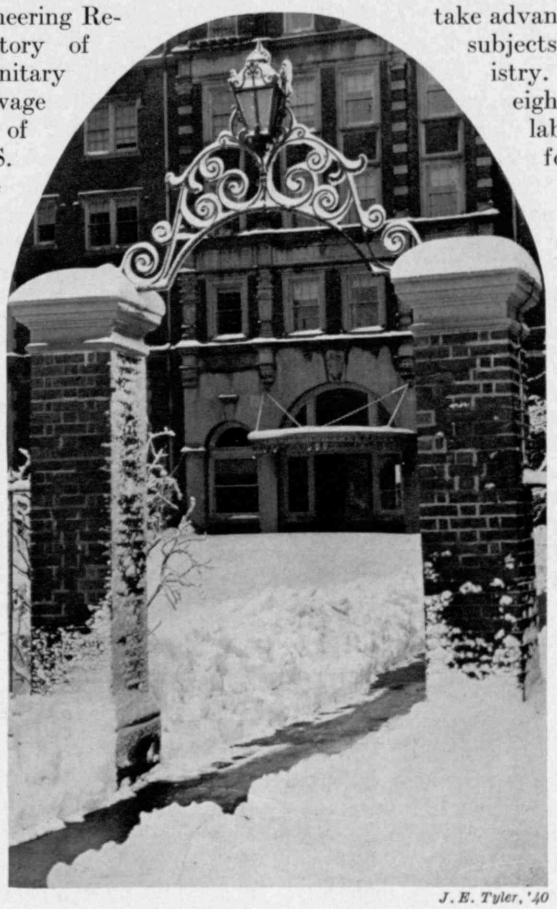
cited in other Departments, but for many years appropriations available for research were pitifully small and the time which members of the staff were able to devote to research was limited because of heavy teaching loads. A number of important investigations were nevertheless carried out prior to 1900. These are to be found in theses, in the *Technology Quarterly* — a journal published by the Institute from 1887 to 1908, and in various academy and society proceedings.

Summarizing the status of graduate work at the close of the century, we find that a total of twenty-three degrees of master of science had been conferred, of which eight, by far the largest number, were in Architecture. No one had matriculated for the doctor's degree but not less than twenty Institute graduates had gone abroad — most of them to Germany — to attain their doctorates. Their travels were made possible to a large extent by fellowship grants from the endowment funds already mentioned, which were greatly augmented in 1899 by the splendid Austin bequest. Returning after two or three years with their doctor's degrees, many of the "fellows" received appointments to the Institute staff, bringing with them enthusiasm for research which was quickly reflected in the output and reputation of the laboratories under their direction. Indeed it was not long before the tide began to turn and instead of feeling they must go abroad for graduate study, students began to come to the Institute to work for the doctor's degree.

Soon after the turn of the century, special attention was directed to research by the establishment of the Graduate School of Engineering Research, the Research Laboratory of Physical Chemistry, and the Sanitary Research Laboratory and Sewage Experiment Station. The first of these was set up by Henry S. Pritchett soon after he became president. In his first report to the Corporation in 1901, he emphasized the desirability of inducing a few especially gifted young engineers to come to the Institute for advanced training, particularly in the field of engineering research. When the School was organized in 1903 it was announced: "While this School will offer an opportunity for earning the degree of doctor of engineering, it is intended that the conferring of the degree shall be a minor feature of the work, and that the few men who are admitted to this work shall be men who are aiming at research and not degrees." A minimum residence of two years was required to obtain this degree. The degree of doctor of science was at the same time discontinued. The administration of the new School was placed in the hands of a faculty council representing the engineering departments and distinct from the Committee on Advanced Degrees and Fellowships which had hitherto been responsible, under the chairmanship of the President, for the administration of graduate study. Four Austin fellowships of $500 each, carrying free tuition, were made available to students who were admitted to the School. It was hoped that these inducements would attract a number of outstanding students, but the result was disappointing. The School was discontinued in 1910 soon after Dr. Maclaurin became president, only one student having completed requirements for the degree of doctor of engineering at that time.

The Research Laboratory of Physical Chemistry was the creation of Arthur A. Noyes, who became its first director. It was supported for many years by contributions from him and Willis R. Whitney, '90, and by grants from the Carnegie Institution and the William E. Hale Fund. During the first years after the establishment of the laboratory, the research work was under the direction of Professors Noyes and Whitney of the Department of Chemistry and Professor Goodwin of the Department of Physics. The laboratory at once became a center for graduate students specializing in physical chemistry and electrochemistry, so that two years after its opening Professor Noyes was able to report: "Especially worthy of mention seems the fact that the establishment of the Research Laboratory has led a considerable number of students to undertake advanced study at the Institute in the subjects of physical and inorganic chemistry. There are at the present time eight candidates pursuing in the laboratory such courses of study for the degree of doctor of philosophy. It is to be hoped that this may be the beginning of a new development of advanced work at the Institute, and that it may soon be possible to start similar research laboratories devoted to other branches of science, especially to the other divisions of physics and chemistry. Such laboratories cannot fail to react in an important way on the character of our undergraduate instruction and on the scientific spirit of our students."

It was now no longer necessary for chemists to journey to Germany for their doctor's degrees. Associated with this laboratory in later years, either as students or as members of its staff, were many who today hold leading positions in our universities and industrial research laboratories. Among them, to mention



J. E. Tyler, '40

Gateway to the Graduate House

only a few, are Gilbert N. Lewis, dean of the college of chemistry at the University of California; Charles A. Kraus, '08, director of chemical research at Brown University; Richard C. Tolman, '03, dean of the graduate school at the California Institute of Technology; and our own Professor Keyes, the present director of the laboratory and Head of the Department of Chemistry. Among directors of industrial research laboratories are Willis R. Whitney, recently retired; William D. Coolidge, '96, of the General Electric Company; and John Johnston, director of the research laboratory of the United States Steel Corporation. It is not too much to say that Noyes's work as a teacher and trainer of research workers in this laboratory did more to enhance the prestige of the Institute in the field of scientific research than did any other single factor prior to the close of the World War. The reputation enjoyed by this laboratory may be judged from a statement in Dr. Maclaurin's annual report of 1911 which quotes the director of the Carnegie Institution as saying of the Research Laboratory of Physical Chemistry: "The Massachusetts Institute of Technology stands clearly first in chemistry."

The Sanitary Research Laboratory and Sewage Experiment Station, also inaugurated in 1903, was financed by an anonymous donor and its activities were directed by William T. Sedgwick, Head of the Department of Biology. This laboratory, located on Albany Street, was devoted to the chemical and bacteriological investigation of problems in the field of sewage purification. Here much valuable research was carried on for sixteen years by a staff of experienced workers, but as the results were not available as theses for the doctor's degree, the laboratory was not a loadstone for graduate students as was the Research Laboratory of Physical Chemistry. This laboratory was continued until the death of its sponsor in 1919; from it were published ten volumes of valuable reports in the field of applied biology.

When Dr. Maclaurin became president in 1909, in addition to the research divisions already mentioned, the Research Laboratory of Applied Chemistry in the Department of Chemical Engineering had been established under the direction of William H. Walker. The number of enrolled graduate students at this time had reached a grand total of twenty-nine, seven being candidates for the degree of doctor of philosophy, one for doctor of engineering, and twenty-one for master of science. The budget appropriated for graduate scholarships and fellowships was $5,100. Graduate work was in charge of the Faculty Committee on Advanced Degrees and Fellowships, of which Dr. Noyes was chairman and Dr. Goodwin, secretary. With the financial outlook anything but bright, the prospect for developing graduate instruction was not encouraging. Nevertheless, Dr. Maclaurin clearly defined his policy by emphasizing the necessity of providing adequately for research and post-graduate work if the Institute were to maintain its position of leadership. When, a few years later, he had raised the funds for moving the Institute to its present site, all Departments were encouraged to include in their plans for the new laboratories ample space for research and its future development. Later on, referring to the needs of the Institute, he said: "The most important of these is to provide more adequate facilities for research, the thing which should be done anyway owing to the great need of encouraging the spirit of research in every department of a great school of science. . . . The training of men in methods of scientific research is an essential part of our task."

In 1916, the new Institute buildings were dedicated and the co-operative plan which had been previously worked out by President Maclaurin and President Lowell for carrying on the engineering instruction of Harvard University at the Institute became fully operative. High hopes were entertained for its success. One immediate result was the strengthening of the staff of the engineering departments. Of particular significance to the Graduate School was the appointment of Arthur E. Kennelly, a man devoted to research, as director of the recently organized Division of Electrical Engineering Research. This division, supported for many years by liberal gifts from the American Telephone and Telegraph Company, did much under Dr. Kennelly's direction to promote research and graduate work in the Department of Electrical Engineering; many members of the research staff were graduate students and their investigations formed the basis of theses leading to the master's or doctor's degree.

A comprehensive study of graduate work was undertaken in 1917 by the Committee on Advanced Degrees and Fellowships and a number of the regulations of the Graduate School in force today date from this period. The committee initiated the action which led to the discontinuance of the degree of doctor of engineering and the re-establishment of the degree of doctor of science. Of the eight students on whom the degree of doctor of engineering had been conferred during the fifteen years it was authorized, six were in Electrical Engineering one in Electrochemical Engineering, and one in Aeronautical Engineering — among them being Vannevar Bush, '16, and Jerome C. Hunsaker, '12. Subsequently, at the suggestion of the Institute, four had the degree changed to doctor of science in order to conform with present practice.

The entrance of the United States into the World War interrupted all regular academic work, and the unfavorable decision of the court in 1918 on the legality of the plan for a joint Harvard-Technology engineering school further delayed plans which had been in the making for the development of graduate work. At the conclusion of the war, however, and with the Eastman and alumni endowment funds assured, Dr. Maclaurin was at last in a position to turn his attention to his educational program. One of his first and most significant acts was to induce the Executive Committee to appropriate $9,000 for the "encouragement of research among members of the staff." He stated to the Committee on Advanced Degrees and Fellowships that this money was primarily for "the encouragement of young members of the staff, assistants, and assistant professors who were actually doing research work, not for men who think that if they were relieved of their teaching duties, they would do research work." He stated that he had little sympathy with the idea that a heavy teaching load absolutely prevented men from doing research. In his opinion the right kind of men (*Continued on page 163*)

To Fit the Car to the Family

Is Conventional Design Sensible in the Light of Economic Trends and Functional Requirements?

By John W. Meader

AUTOMOBILE designs do not now appear, to many well-informed observers, to face the prospect of revolutionary change, but others see reasons which they feel do not justify complacence about the years which are yet to come. If conventional passenger car design is analyzed from a functional standpoint, it does not meet the test so well as might be expected, certainly not so well as do alternative and equally feasible constructions. Also, recent changes in design seem to have gone directly counter to the dictates of changes in economic conditions. Following these lines of thought, one can be led quite reasonably and naturally to a type of car different from any which has yet been put to the test of the market place.

The passenger automobile of standard type is now a six-place vehicle. Why should it be of that particular size? The ownership and use of a car are mainly a family matter; the capacity of the car ought to correspond approximately with the size of the typical family. But the average family in the United States comprises only four persons. Also, there is an inverse relationship between the size of the family and the ownership of a car.

About 96 per cent of all car-owning families in 1930 numbered four or fewer persons. About 42 per cent of car-owning families numbered only one or two individuals. Many families had two or more cars. The size of the family unit has been declining. Road counts show that only a small fraction of cars in use carry more than two persons. When there were not enough cars to go around, excess capacity served a real need, and it is still a desirable quality in some export markets, but in this country we now have a car for almost every family.

There are, it is true, some four-place and a few two-place designs, but almost all of them are makeshifts — optional bodies on chassis designed throughout for loads of six. The fact that these hybrid products have been accounting for important and recently increasing percentages of total car sales deserves more attention than it has had. It seems quite likely that a six-place or larger car represents a misconception of its typical use. The standard type should be a four-place vehicle. Failure to appreciate the importance of this basic requirement may have been largely responsible for the disappointing acceptance of recent innovations like the Willys, Studebaker, Lincoln-Zephyr, and Scarab, the last from the board of William B. Stout, former President of the Society of Automotive Engineers.

There is needless confusion over size and roominess. Undoubtedly the public want big cars, and perhaps they really want their cars to look bigger than actuality. But the public have not been given an opportunity to choose between a roomy four-place car, built to that standard from the ground up, and what can be described functionally only as a small motorbus or half-ton truck chassis which may be equipped with various optional superstructures.

The arrangement of the load in a four-place design presents fewer problems than in a six-place unit. It seems to be established that two seats in tandem and four doors will be more widely acceptable than any other disposition. It may also be assumed that four-wheel running gear with front-wheel steering, left-hand drive, brakes on all wheels, and pneumatic tires are standardized for sound reasons.

Now, if we have to brake on four wheels, should we not also drive on all four? If the drive is to be on two wheels only, should they be the front or the rear wheels? Where should the power plant go, front or rear? May we consider dual wheels? Or front and rear tires of different sizes? Let us say that these questions are resolved in favor of single wheels, a uniform tire size, and rear wheel drive. Then we are almost forced, for reasons of directional stability, to provide somewhat more weight on the rear wheels than on the front under all loading and driving conditions. For the fairly common condition of driver alone, no baggage, almost empty fuel tank, and maximum deceleration, there is simply no choice in the location of the power plant. It has to go at the rear! Not only for better braking, but also to eliminate "oversteering" tendencies at high speeds. The rear seat should be somewhat aft of the middle of the car if the weight distribution is to be affected as little as possible by changes in load. The front seat might be, for the same

In Central Park a generation ago, the beauteous Virginia Harned rode in state in this horseless carriage which is obviously the direct descendant of a victoria, complete with dash, mudguards, lamps, and steps.

Keystone View

reason, a bit aft of the front wheels. Baggage compartment (if any), spare tire, and fuel tank would go over or ahead of the front wheels.

With the running gear settled and the loads disposed, the body structure almost designs itself, the roof and floor becoming the chords of a truss. Except as to size, the layout might closely resemble the Scarab. The fact that this remarkable vehicle is not a commercial success does not detract in the least from its value as living proof of the feasibility of such a design; its eight-passenger capacity was a fundamental error, but the design is nevertheless most interesting. It has about the same weight and power as conventional, low-priced cars, but experts who have tried one of the few samples in existence agree that it surpasses the conventional cars in performance and comfort, especially at high speeds on average and inferior roads.

The framework of the Scarab is made of welded alloy-steel tubing. The engine and drive are at the rear; the windshield is directly over the front wheels. Power brakes are used and each wheel is independently sprung. Shock absorbers are done away with, for the car is sprung on a kind of air bellows, developed by Firestone, in which the action is automatically adjusted to load, road, and speed by simple inertia valves. Since the suspension center is at about the same height as the center of sprung mass, there is no rolling of the body on turns.

There is another, more subtle difference. The Scarab was designed by an artist who understood the importance of lightness and showed great skill in achieving it. On the other hand, we are told on equally high authority that weight is not disadvantageous if it is balanced by lower costs of production. Current products reflect the prevalence of that opinion, best voiced perhaps by Henry M. Crane, '95, also a past President of the Society of Automotive Engineers. Said Mr. Crane recently: "The fact that the present-day motorcar is constructed almost entirely of cast iron and low-grade steel is no accident. The low cost of such material, coupled with its adaptability to present methods of fabrication, is an outstanding advantage. . . ."

These opposing views are not entirely inconsistent, for weight and cost, inherent drawbacks in the design of any transport equipment, are in considerable degree mutually dependent. It costs money to save weight. If weight were disregarded entirely, costs could be brought down much lower than they are. To strike a satisfactory balance is admittedly very difficult, but in the absence of a quantitative guide, every item of weight should be treated with just as much suspicion as each element of production cost. Any other attitude is questionable on logical grounds. To worship at the shrine of price per pound is to set up a false god. It makes weight, rather than lack of weight, an excuse for a higher price.

Although there is room for argument over the exact value of optimum specific cost, it is an entirely different matter when we are concerned with differences which affect both cost and weight in the same direction at the same time. Here again is seen the vital importance of accuracy in fixing the size of the design, that is, the number of passengers to be provided for. If built to the same standards, a four-place car would obviously permit nearly one-third less cost and weight than a six-place design. If, in addition, a "frameless" design can be built lighter and at less cost than the conventional product, full advantage should be taken of that opportunity.

The present requirement that bodies, axles, power plants, and frames be designed for subassembly at scattered points, traces in part to the nature and location of existing factories and the investments they represent. But circumstances of that kind should not be allowed indefinitely or unduly to restrict design. It is a serious mistake to burden a new design with the expense of rearranging plant facilities when making cost comparisons for engineering purposes. If an investment will have to be written off, that is too bad; but the mistake was in the past, in the failure to write off more promptly, and not in the new design. Viewed in their true perspective, the costs of the old design were understated. The risk of future obsolescence is reduced if, through a change in design, a sounder concept is attained.

On the whole, then, it appears that a four-place, frameless, rear-engined car may have inherent advantages in performance, safety, cost, and weight, over a car of conventional size and arrangement. Now, disregarding for the moment the conclusions drawn from the foregoing discussion, let us examine the changes in conventional design during recent years in the light of parallel changes in economic conditions, and see if these changes in design were consistent or divergent.

Since the purpose of the examination is to illustrate a method of approach rather than to make a precise and labored analysis of design history, it may be viewed through the familiar Automobile Manufacturers Association calculations of the average power, weight, and price of American passenger cars sold. These data have an important limitation. Being weighted by registrations, they represent a composite of what the factories have designed and what the public have selected from these designs, where they had a choice. To the extent that the designs have been alike at any given time, the available range of choice has been circumscribed, but due allowance should be made for any likely division of responsibility for the changes which have taken place.

It seems a fair statement that in recent years our leading designs have become heavier, more powerful, and, until very recently, lower in (*Continued on page 170*)

The Scarab — an application of functionalism in design which results in a vehicle in no way suggesting Dobbin and the family surrey

Stout Engineering Laboratories

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

The Corporation

EDWARD R. STETTINIUS, JR., chairman of the board of the United States Steel Corporation since 1938, was elected a member of the Corporation of the Institute at its meeting on January 3, and Ralph E. Flanders, who has been a special term member of the Corporation for the past three years, was elected a life member.

Mr. Stettinius is a native of Chicago and was educated at the Pomfret School and the University of Virginia. He began his distinguished career in industry in the General Motors Corporation in 1924, later becoming assistant to Alfred P. Sloan, Jr., '95, who was then its president. In 1931, Mr. Stettinius was elected vice-president of General Motors in charge of industrial and public relations. He became vice-president of the General Aviation Corporation in 1934 and has been a director of various aviation enterprises. In 1932, he was in charge of the national Share-the-Work Movement for the Second Federal Reserve District, and the following year he was appointed liaison officer between the Industrial Advisory Board and the National Industrial Recovery Administration in Washington.

Mr. Stettinius is also a director of the Metropolitan Life Insurance Company, a trustee of the Roosevelt Hospital, chairman of the finance committee and vice-president of the New York Museum of Science and Industry. A trustee of the Pomfret School and a member of the alumni board of trustees of the University of Virginia, he is a member of the advisory council on Social Security, the business advisory council of the United States Department of Commerce, the Academy of Political Science, and the Economic Club of New York.

Mr. Flanders is a native of Barnet, Vt., and is president of the Jones and Lamson Machine Company of Springfield, Vt. He holds honorary degrees from Dartmouth, Stevens Institute of Technology, Middlebury College, Rose Polytechnic Institute, University of Vermont, and Brooklyn Polytechnic Institute.

President Compton announced at the January meeting the creation of a special committee of the Corporation to study methods of enriching student life at the Institute — the study to include living facilities and extracurricular activities. The Corporation also approved the conferring of a number of midyear degrees and presented a memorial to Henry S. Pritchett, who was president of the Institute from 1900 to 1907. Mr. Flanders presented the report of the Corporation's Visiting Committee on the Department of Mechanical Engineering, which drew attention to the urgent need for additional laboratories for training in automotive engineering. Since the construction of the Sloan Laboratory, he said, student interest in this field has grown, and registration for automotive engineering has increased from eight to 105 students, of whom forty-seven are carrying on graduate work, chiefly in research.

Faster Photography

FASTER lenses for cameras are in prospect as a result of the work of C. Hawley Cartwright of the Department of Physics, whose method of evaporating metallic fluorides greatly increases the effective speed of lenses. At the recent meeting of the American Association for the Advancement of Science held in Columbus, Ohio, Dr. Cartwright reported studies of a highly corrected f:2 lens composed of five separate elements, on all surfaces of which a fluoride film had been deposited. The effective speed of this lens was increased nearly 100 per cent. The extent of the improvement depends on the complexity of the lens. The increase in speed obtained by coating a three-element f:3.5 lens was much less than for the f:2 five-element type.

The method is an outgrowth of Dr. Cartwright's earlier work in which, with the help of A. Francis Turner, '29, he developed the method of reducing reflection and adding to the transmission of light through glass. Faster and more highly corrected camera lenses require a large number of separated elements. Each of these reflects about 10 per cent of the incident light. Thus, good camera lenses ordinarily have transmissions of only about 60 per cent. The light reflected from each surface is, unfortunately, not merely lost, for about 5 per cent of it is reflected again from other surfaces. Some of the reflected light strikes the photographic plate or film, where it supersensitizes the emulsion and sometimes produces the familiar flare pattern or ghost images.

H. Dennis Taylor observed in 1892 that tarnishing of camera lenses tends to an increase of their effective speed. The tarnished surfaces of the glass elements of high refractive index diminished the reflection of light from the air-glass surfaces and thereby increased the transmission of the whole camera lens. Various methods were devised for artificially tarnishing glass, but apparently the results were not sufficiently effective to justify their adoption by the manufacturers of camera lenses. It is now evident that the tarnish is actually a film of a transparent material having a lower index of refraction than that of the glass. To be most effective, it should fulfill specific conditions which can be better satisfied by the evaporated films of the metallic fluorides.

The evaporated metallic fluoride film, Dr. Cartwright said, has proved effective for many optical instruments. Since the film must be deposited in a vacuum and since each of the many elements in a camera lens should be so treated, the method is much more easily applicable in the manufacture of new lenses than in the treatment of ones already in use.

T.E.N. at Twenty

OUR journalistic relative, the *Tech Engineering News*, last month commemorated the completion of its twentieth year of successful collegiate publication. The event was celebrated by making the annual formal banquet a home-coming party for the Alumni who had served on the journal's managing boards since its founding. The principal speaker, who reminisced with interest and effect, was Raymond A. St. Laurent, '21, one of the founders of the *Tech Engineering News*, now sales director of the Rogers Paper Manufacturing Company in Manchester, Conn. The potentialities of a student monthly engineering journal at the Institute were first realized in 1919 by St. Laurent and Hazen C. Pratt, '21, now research engineer with the Minneapolis Moline Power Implement Company in Minneapolis, Minn., both of whom were then members of the staff of *The Tech*. A survey of the possibilities in advertising was started by Pratt, and in February, 1920, the first issue of the magazine appeared.

The journal was an immediate success in the collegiate magazine field and during its second year was chiefly instrumental in founding Engineering College Magazines Associated, an organization for editorial and business co-operation among its members. The association now has a membership of twenty-four college engineering journals.

The *Tech Engineering News* has always been a national leader in its field. In 1936 it received particular distinction in winning permanent possession of the Yale Cup, offered by the *Yale Scientific Magazine* to the college engineering magazine which for three successive years should be judged the best in the country. Since then, the Tech Engineering News Cup has been put into circulation to take the place of the retired Yale Cup.

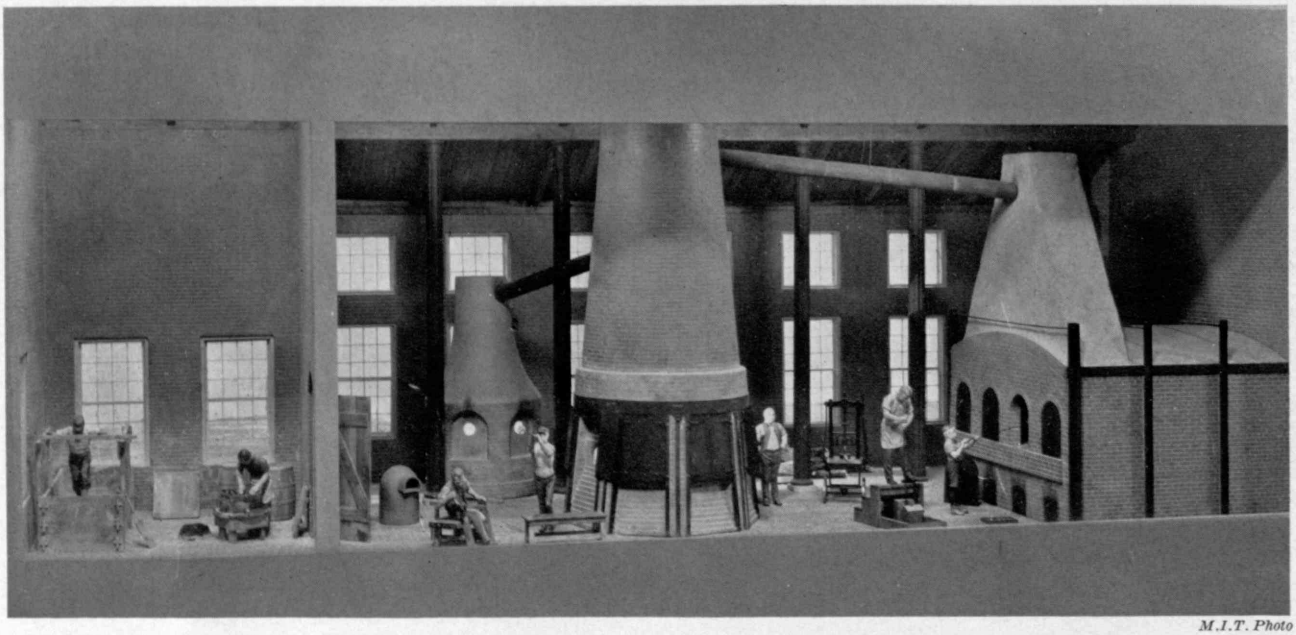
The outgoing board, which guided the journal to the close of its second decade, was headed by R. Dixon Speas, '40, general manager, and included Jack H. Schaum, '40, editor in chief, and Samuel P. Card, '40, business manager.

Recognition

AWARDS of $300 each, given annually in memory of William Barton Rogers, the founder of the Institute, in recognition of high scholarship, character, and leadership in student affairs, were recently presented to six seniors. The recipients of this year's awards were Thomas F. Creamer of Brooklyn, N. Y.; W. Happer Farrell of Washington, D. C.; Frederic W. Hammesfahr of New Rochelle, N. Y.; John H. Hollomon of Norfolk, Va.; Henry Rapoport of Atlantic City, N. J.; and Phelps A. Walker of Winnetka, Ill. Presentation was made by President Compton in the presence of the Faculty Committee on Undergraduate Scholarships and the Heads of the academic Departments in which the students are studying.

The Library's Year

THOSE who benefit from modern libraries are usually unaware of the complex organization and the constant effort to give complete and efficient service that are masked by the traditional hush of the reading room



M.I.T. Photo

This model of a mid-Nineteenth Century glassworks, based in a general way upon the famous Sandwich Glass Factory, was built in the Hobby Shop under the direction of the Institute's Museum Committee and combines the interest of students and staff alike. Apparatus and processes are accurately represented. At the left a man treads clay for use in making fire pots such as that upon which the next worker is engaged. In the main body of the factory, a team of men are at work, one blowing glass lamp bowls which are finished by his partner, who is seated in the glassmaker's chair. Beyond the furnace stands the gaffer, or boss, near a glass press which is the work of John M. DeBevoise, '42. Nearer the annealing oven at the right, a worker is blowing glass into a foot-operated mold. The apprentice boy is placing finished ware in the annealing oven. The examples of ware were made by the Corning Glass Works to designs by Frederick H. Norton, '18, Associate Professor of Ceramics, whose long study of the history of the art contributed greatly to the accuracy of the model . .

and the stacks. The Institute's great scientific and engineering library of more than 340,000 volumes, from which students and members of the staff make about 600 loans a day, is no exception to this truth.

The use of the Library is increasing faster than student enrollment. Last year it was 3 per cent greater; the year before, 9 per cent. The greatest increase during 1938–1939 was in the circulation of "overnight" or "week-end" books from the reserve collections set up for a term or longer as adjuncts to the teaching of various courses. About 66 per cent of all loans were made to students, the rest to staff, Alumni, Institute employees, industrial concerns, and other libraries.

A new service was started in the Central Library in the fall of 1938 with the installation of a projector for the viewing of microfilm. This service is available to students or Alumni who have films of their own or who wish to view films borrowed from other libraries. Microfilm is particularly valuable for copying material in distant libraries.

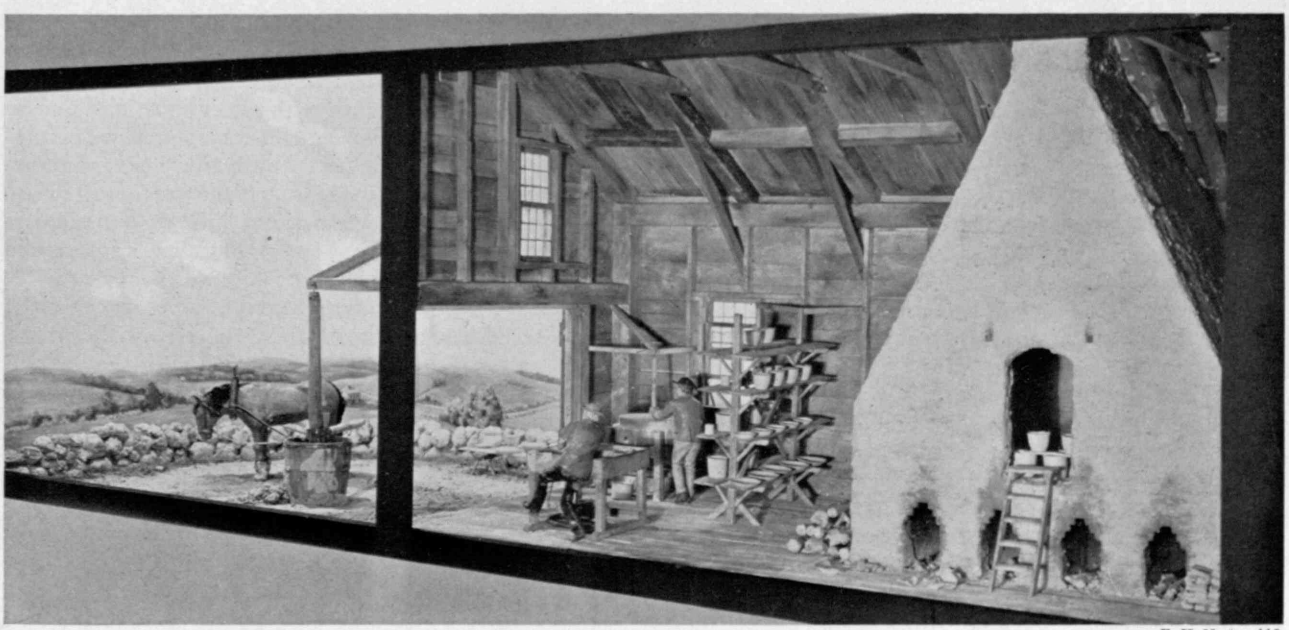
A considerable collection of books and periodicals, including duplicates from the Institute Library and donations by various members of the Faculty, has been sent recently to the National Tsing-Hua University in China, where Karl L. Wildes, '22, Associate Professor of Electrical Engineering, was lecturing just before the outbreak of the war in China. This contribution is Technology's answer to the general appeal to American universities to help overcome war damages to China's university libraries.

The Library received a net addition of 8,082 volumes during the last academic year, bringing the estimated total to 340,089 volumes. Some of the more outstanding gifts were made through the efforts of the Friends of the Library. Through this valuable group, Melville Eastham presented a set of Purchas' *Hakluytus Posthumus, or Purchas his Pilgrimes*, and English translations of Nordenskiold's *Facsimile-Atlas* and *Periplus*. Other outstanding gifts were 245 architectural books from the library of Arthur W. Rice, '91; forty-nine volumes in Spanish from the library of George A. Hutchinson, '98; 238 volumes from the estate of Professor Emeritus Henry Fay, and 275 additional volumes bequeathed by Charles F. Hopewell, '93.

The continued activity of the Library was particularly noticeable in its six branches. Circulation from the Dewey Library since its establishment nearly two years ago has grown by nearly 37 per cent. The material in that branch was entirely reclassified in order to make the books stand on the shelves in more logical order, in accordance with modern trends in the literature on economics and business. The rapid growth of the Walker Memorial branch has made it necessary to seek additional space during the coming year. A further enlargement in facilities may take place in the future with the formation of a new branch library for the Division of Humanities. The Central Library is also growing, fast enough so that Professor William N. Seaver, Librarian, estimates the present space will be sufficient only for about another ten years.

Henry Greenleaf Pearson, 1870–1939

WARMHEARTED as the man whom they honored, memorial services were held at the Weston Unitarian Church on December 30 for Henry Greenleaf



F. H. Norton, '18

. . A redware pottery of the early Nineteenth Century is presented by this model, likewise built in the Hobby Shop under the auspices of the Museum Committee, of which Arthur C. Watson is chairman. Such localized rural industries, established near clay pits, were characteristic of the time. The horse harnessed to a pugmill at the left is furnishing power to grind the clay. The owner of the plant is shown at the potter's wheel, making ware like that drying on the rack near him. In the corner the apprentice is grinding glaze materials between two millstones. After being dipped in the glaze, the ware will be placed in the kiln, the opening of the kiln will be closed with the brick lying in the lower right corner, and the ware will be fired. The miniature pots and plates used in the model were made by Professor Norton. To this model, as to the other, contributions of counsel were made by Walter C. Voss, '32, Professor of Building Construction; Albert G. Dietz, '32, instructor in Civil and Sanitary Engineering; and Herbert L. Beckwith, '26, Associate Professor of Architectural Design.

Henry Greenleaf Pearson

Pearson, Professor Emeritus of English, Head of the Department of English and History for nineteen years, and a member of the Institute's Faculty for forty-six. Professor Pearson's death had occurred on December 28, but two days after his sixty-ninth birthday, and followed the two years of ill-health which had occasioned his leave of absence early in 1938 and subsequent retirement.

Professor Pearson's contribution to Institute education during his long term of service took many forms — expansion of the teaching of literature and history in terms interesting and alive to the undergraduate, development of general-study electives especially adapted to the needs of students of engineering and science, constant application of ingenuity and inventiveness to finding new ways of making fresh and vigorous the business of precision in writing and in speech, devotion of many hours to student problems as musical clubs, the Walker Club, and other activities and social relations produced them, broadening of the curriculum of his Department through a system of options designed to give the student the greatest range of choice from the humanistic studies available to him. All of these were given force and direction by the fact that they were focussed constantly on his primary aim, which was to serve the development of the student in intellectual breadth and social consciousness.

Biography was a source of studious enjoyment to Professor Pearson and a literary form in which he was long active, his last book being a sympathetic and understanding biography of Richard Cockburn Maclaurin, who was president of the Institute from 1909 to 1920. Professor Pearson's interest in, and wide knowledge of, biography underlay the introduction into the Institute curriculum of general studies in which the biographies of men of science and men of affairs were basis for discussion and report. Early in his teaching career, Professor Pearson published a textbook, *Principles of Composition*, and his biographical writings include *Son of New England*, a biography of James Jackson Storrow; *Life of John A. Andrew, Governor of Massachusetts; An American Railroad Builder; James S. Wadsworth of Geneseo; Life of William Howe McElwain; A Business Man in Uniform;* and *An American Soldier and Diplomat*, the latter written in collaboration with Elsie Porter Mende. He also contributed to the *Commonwealth History of Massachusetts* and to the *Dictionary of American Biography.*

Professor Pearson was a member of the American Historical Society and the Massachusetts Historical Society, and his fraternities were Phi Beta Kappa and Theta Xi. Born in Portland, Maine, he was graduated from Harvard University in 1893. In the same year he joined the teaching staff at Technology as an instructor in English. He became assistant professor in 1898, associate professor in 1907, and professor in 1915, and was placed in charge of the Department of English and History in 1919.

In 1898 Professor Pearson married Elizabeth Ware Winsor, whose graciousness as a hostess will long be remembered by hundreds of students who have known the pleasure of the informal gatherings which were a custom at their home in Newton Center, Mass.

Visiting Committee Report

DEPARTMENT OF AERONAUTICAL ENGINEERING*

ALTERATIONS in the Guggenheim Building necessary to provide space requirements for an increase of approximately 25 per cent in enrollment are recommended by the Committee. Unification and expansion of the work in automotive engineering are likewise recommended, and in view of the importance of automotive engineering and of the government's interest in the unique facilities of the Institute, the Committee hope that ways and means may be found to construct a suitable addition to the Sloan Automotive Laboratory. The Committee approve co-operation with the government in the program of flight training for selected students.

The award of graduate scholarships to students of superior ability to enable them to continue their studies for a fifth year is recommended; the Committee advocate that if new funds for scholarships become available, first consideration be given to the creation of honors scholarships. The national importance of aeronautical engineering leads the Committee to recommend that Course XVI be given the status of a Department in the administrative organization of the Institute. [The Committee's recommendations (*Concluded on page 174*)

* Members of this Committee for 1938–1939 were Godfrey L. Cabot, '81, Chairman, B. Edwin Hutchinson, '09, Donald W. Douglas, '14, Edgar S. Gorrell, '17, Theodore P. Wright, '18, Edward A. Deeds, and George W. Lewis.

THE FASTEST TRAINS

(*Concluded from page 149*)

cared to use except in isolated cases such as the celebrated "racing" which began in the early 1900's between Camden and Atlantic City.

The influence of the Diesel upon American services has been, rather, that it convinced reluctant railroad operators that the public wanted speed in transportation — and would "go for speed in a big way" if speed were accompanied by other improvements. The early experimental Diesel power units were incapable of hauling standard heavy steel passenger cars, and those who championed the Diesel were perforce obliged to design lightweight cars and thus to take advantage of the new alloys with which metallurgy was concurrently burgeoning.

When the *Pioneer Zephyr* went into service, railroad operators still classed air conditioning as a luxury rather than an essential although the first completely air-conditioned train (the *Columbian* of the Baltimore and Ohio) had then been running over two years. But the proponents of the Diesel train welcomed air conditioning with open arms; they borrowed from the experiences of aircraft builders, automobile manufacturers, and furniture makers; they accepted the advice of artists and illuminating engineers; they even sought the opinions of members of the traveling public; and they streamlined their product on psychological grounds as well as on account of the engineering merits of designing it that way. As a result the Diesel train evolved, both inside and out, as something quite different in appearance from anything hitherto seen on railroads — something which provided passengers both novelty and speed. True, the earlier units were cramped and the vibrations from the power plants were often unpleasantly noticeable, but these drawbacks were soon overcome.

During the 1930's, therefore, Diesel trains encouraged railroad operators to think that revising their passenger-carrying equipment and speeding up trains had rewards in increased patronage. These lessons are now being reflected more and more in the types of cars which steam and electric prime movers are hauling, and in the rates at which trains are scheduled no matter by what means they are propelled.

The quest for the maintenance of higher average speeds involves a multitude of factors, only a few of which may here be suggested. Besides improvements in motive power to permit more flexibility in the rates of acceleration and deceleration, the time required for service stoppages may be cut by provision of greater fuel capacities on locomotives and by decrease in time required for the delivery of coal or oil when such stoppages become necessary. Similarly, attention to the handling of passengers, express, and mail at intermediate terminals saves time. An analysis of the causes of slowdowns points to an increase in the weight of rail, to changes in track alignment, to changes in signaling, to longer turnouts and crossovers, to more attention to the details of track and bridge maintenance, to electrical manipulation of switches, and to reductions in grades and curves.

Curvatures which are no hazard even at advanced operating speeds may have to be eased for the peace of mind and physical comfort of the passengers. The net effects of curves upon the average speed permissible depend, of course, upon the number and sizes of the curves, and how they are spaced over the line. But the effect of curvature upon possible average speed is suggested by a comparison of total curvatures encountered by the Pennsylvania's *Congressional* and the New Haven's *Yankee Clipper*. The lengths of their runs, as shown in Table 2, are practically the same, 227 and 229 miles; the former train makes five scheduled intermediate stops, the latter four; the grades are not materially different. But the total curvatures between New York and Washington are the equivalent of 9.6 complete circles, whereas between New York and Boston they are the equivalent of 18.13. Slowing down to spin around twice as much is obviously one of the main reasons why the *Yankee Clipper* makes 50.9 while the *Congressional* does 63.0.

THE GRADUATE SCHOOL OF M.I.T.

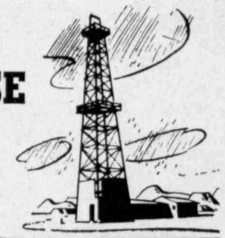
(*Continued from page 156*)

would be doing some research work even though the output were small. This was the first time that such a policy, backed by an appropriation, had been made. The untimely death of the President in January of the following year prevented him from carrying out his research program. Fortunately, the policy thus initiated was continued by the Administrative Committee (1920–1922) and later by President Stratton. To encourage research further by the prompt publication of results, the Institute established in 1921 the *Journal of Mathematics and Physics*, at present edited by representatives of the Departments of Mathematics, Physics, and Chemistry.

In 1922, the Executive Committee approved a plan, free of legal entanglements, for coöperation in graduate work between Harvard University and the Institute, the provisions of which were as follows: "It is agreed between Harvard University and the Massachusetts Institute of Technology that during the academic year 1922–1923, advanced courses, other than courses prescribed in undergraduate programs or courses in research, may with the consent of the instructor and dean or head of the department in which the student wishes to work, be taken in either institution by students of the other, without payment of fees." This vote was again confirmed in 1926 by the administrations of both institutions and has been operative ever since. Such an interchange of graduate students was not wholly without precedent, for after Reginald Daly, Professor of Geology, left the Institute to join the Harvard faculty in 1912, Institute students desiring to take work in dynamic geology were admitted to his classes, while Harvard students interested in economic geology were welcomed to the classes of Professor Lindgren on an exchange basis. This coöperation in graduate work between the two institutions has everything to commend it. The exchange privilege is being taken advantage of to a greater and (*Continued on page 164*)

CHARTING THE COURSE

From the surface— to the sands!



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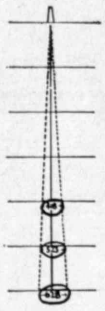

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IF WAR COMES

(*Continued from page 164*)

humidity and must function perfectly, notwithstanding. It is no exaggeration to say that many of the fires and explosions in munitions plants and storage depots have resulted from the use of materials which had been insufficiently purified.

MOST of the materials which have been mentioned are used as raw materials for the manufacture of the finished products required by the government. Given the raw materials, factories must be had, and in many divisions there are in this country virtually no plants for the production of these finished products on anything like a wartime scale. It will be interesting to see what sort of plans the government is making to take care of this situation in time of war.

But before examining these plans, refer again to that paragraph in section 120 of the National Defense Act concerning the list of privately owned plants prepared by the Secretary of War. The preparation of this list has been delegated to the Assistant Secretary of War, who, under section *5a* of the same act, has been "charged with the supervision of the procurement of all military supplies and other business of the War Department pertaining thereto and the assurance of adequate provision for the mobilization of matériel and industrial organizations essential to war-time needs." Since the Assistant Secretary of War has no authority to deal with matters pertaining to the Navy and since the Navy is equally interested in this sort of work, however, there was organized in 1922 a joint board to carry out the listing. Called the Army and Navy Munitions Board, it was, by executive order of last July 5, made directly responsible to the President. The board has been engaged in the preparation of the list, which is now reasonably complete.

Simultaneously with the preparation of the list, an industrial mobilization plan has been made, with the approval of the Army and the Navy. Copies of the 1936 edition of the plan may be obtained from the Superintendent of Documents, Washington, D. C., for fifteen cents, and should be in the hands of every person who expects to be affected by section 120 of the National Defense Act. (The 1939 edition is not yet available.) Though the plan does not now have the force of law, upon outbreak of war present legislation, together with proposed new legislation which has been prepared for the purpose, will most likely permit its application in substantially its present form. Its object is to utilize most efficiently the war powers of the President, the authority likely to be accorded by Congress, the wartime power of commandeering, and the force of public opinion. Among the principles to be followed in the application of this plan are: (*Continued on page 168*)

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IF WAR COMES

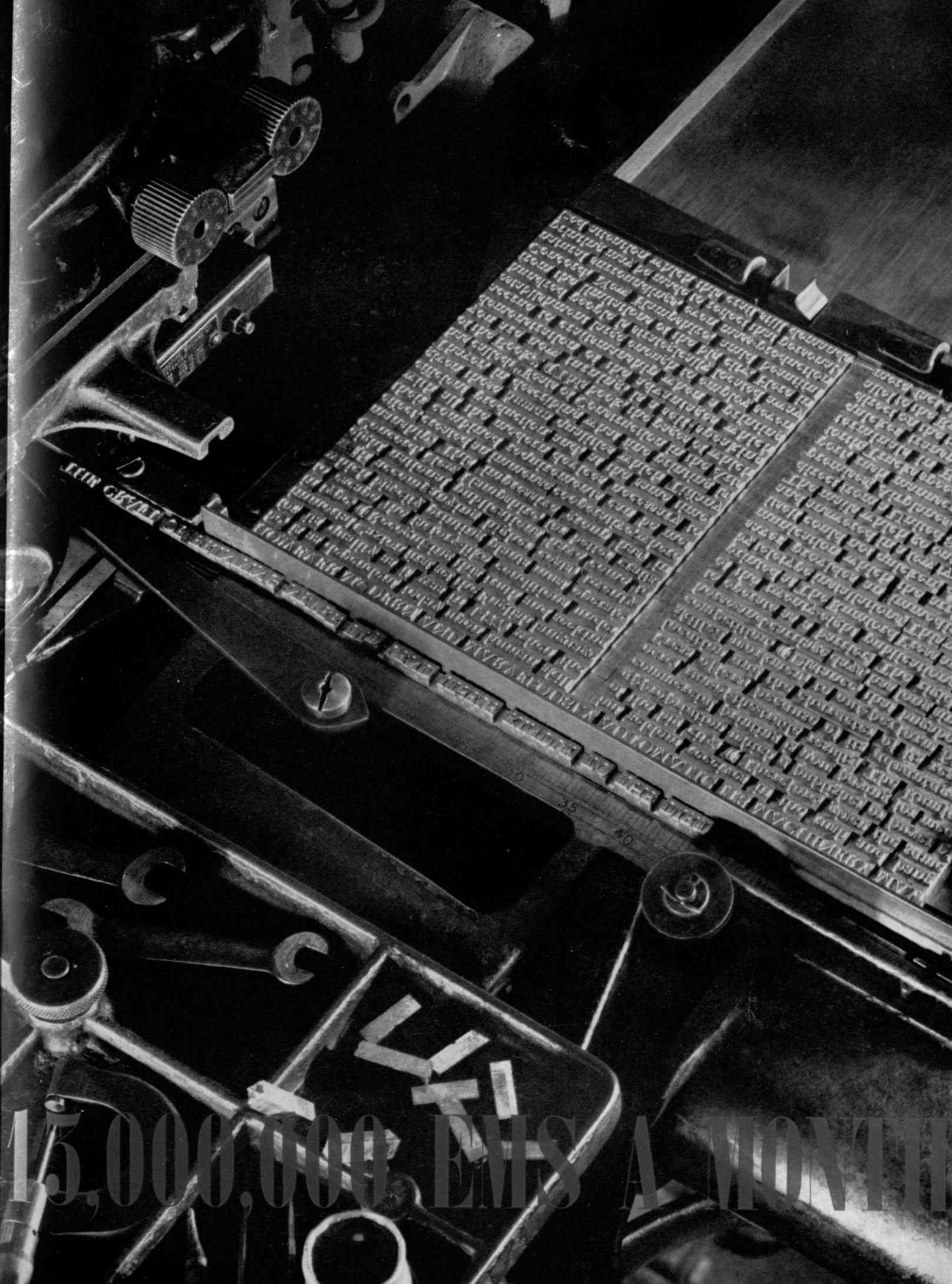
(*Continued from page 166*)

1. The prompt procurement of raw materials.
2. Due consideration to the *essential* needs of the civil population.
3. The least possible disturbance in the normal economic life of the country.
4. Avoiding of competitive bidding among various government departments.
5. The proportional division or allocation of industrial resources between the Army and the Navy.
6. The peacetime education of industry in regard to wartime problems.

In connection with the fifth of these stipulations, the country has been divided into districts, and the wartime requirements of the Army and Navy have been allocated to each district in proportion to the production facilities of that district for the material in question. For example, the procurement requirements of the ordnance department, which must supply the Army with all its guns and ammunition, tanks and combat cars, and fire control instruments, have resulted in the division of the country into sixteen ordnance procurement districts. The more important plants in each district making an essential material, or interested in so doing in wartime, have been or will be approached by representatives of the government and asked to sign an agreement to the effect that the plant in question will be willing, in time of war, to undertake production of that particular material for the government in the amount and at the rate agreed upon.

In connection with the sixth stipulation, under authorization of the act of Congress of June 16, 1938, certain of these plants which have already accepted wartime production schedules have been awarded educational orders for the product which they have agreed to make, so that they can gain experience in the problems of production ahead of time. Specifically, the more important measures applicable to the control of industry in war include priority control, price control, commandeering, control of foreign trade, and organization of government corporations.

Priority control will accomplish three things: It will direct the flow of materials and labor into the channels of supply of the warmaking agencies. It will divert the use of resources from nonessential needs into channels of essential production. And it will assume the equitable distribution of what is left to the civilian population. Price control will be needed to call into production high-cost producers who cannot operate profitably in peacetime to make up diminished supplies for civilian uses; to curtail reckless government buying; to allow for high-cost production due to the substitution of unskilled labor to take the place of drafted skilled labor; to take care of increased insurance, interest, and taxes; to stimulate essential imports; and to counteract the effects of currency inflation. The third method, commandeering, authorized in section 120, is to be used as a last resort when the other less positive measures fail to produce the required results. (*Continued on page 169*)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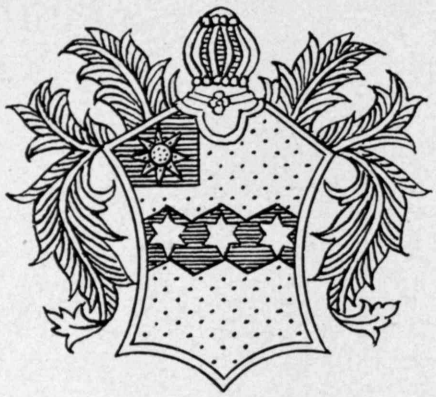

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IF WAR COMES

(*Continued from page 168*)

Now, suppose that war has been declared and that a specific plant, which manufactures, for example, sulphuric acid, has previously signed a production schedule with the ordnance department of the Army for that essential material. In due time there appears at this plant a government official with a formal contract between that company and the government, the signing of which will permit the plant to start its scheduled production. The kind of contract to be signed will depend on circumstances. If the plant has agreed to make for the Army a quantity of acid not greater than four-fifths of its twenty-four hour a day production, and the government proposes to leave the remaining one-fifth free for disposal to the regular peacetime customers of the company, there probably will be signed what is called the fixed-price contract. This differs from the peacetime contract in that it is not based on competitive bidding but is negotiated with each contractor individually so that the price agreed upon depends on the production costs of that particular plant. (A yardstick for appraisal of production costs is available from data accumulated in government arsenals.) It also differs in that it has a termination clause and a flexible price clause relating to changing raw-material and labor costs where such changes have been made by a Federal agency under its price-fixing authority. If, on the other hand, the company has agreed to make for the Army more than the four-fifths of its full production, the plant will have to be enlarged. If this enlargement is done at government expense, the company will probably sign an evaluated fee construction contract, which pays a variable fee depending on how good a job is done. In this case, the new construction belongs to the government and reverts to it at the termination of the contract, for its disposal. However, if the company prefers to build the additional plant at its own expense, it may wish to sign an adjusted compensation contract which protects it against loss and which offers extra profits depending on the savings produced — these savings being shared between the government and the company.

After production has started, the government undertakes by priority and price control to insure the plant its fair share of raw material and of labor at reasonable prices. Some of its peacetime labor will undoubtedly be lost through the draft, but really necessary specialists will be given deferred classification, and the losses will be made up by breaking in new labor outside the draft age, which at present is twenty-one to thirty years.

The sulphuric acid must meet army specifications; otherwise, it will not be acceptable, and an army inspector of ordnance will be located at or near the plant so that he can keep it under constant supervision. The inspector, in addition, is the immediate contact between the company and the government and he will undertake to act as a go-between in all cases requiring adjustments in priorities, prices, and the like. It is his business to assist the plant in every way to fill its contract. Plants which have not previously signed a production schedule agreement, in time of war will have to take second place on raw materials, (*Concluded on page 170*)

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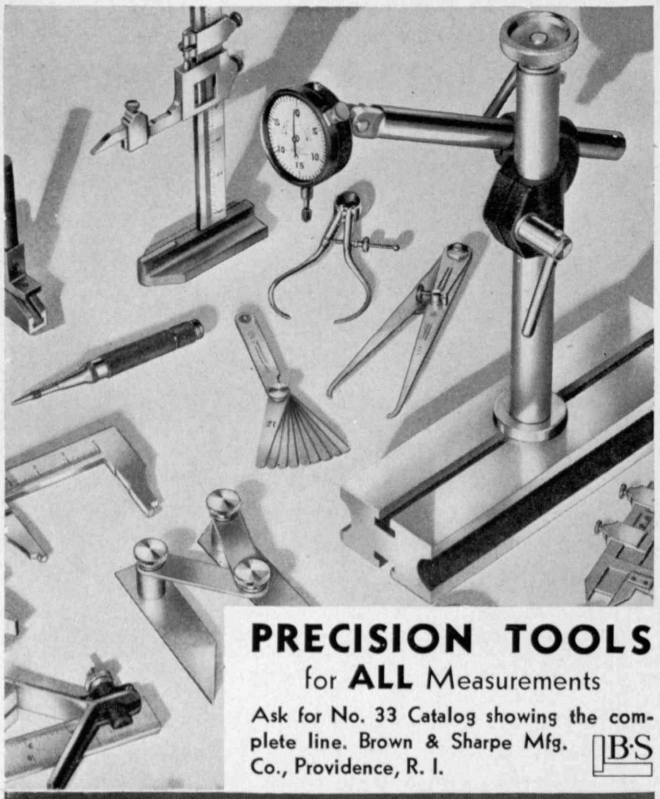

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IF WAR COMES

(*Concluded from page 169*)

labor, power, and so forth, giving priority to those plants which are on government contract. Also, if in peacetime the plant uses raw materials now listed as critical, a rating which means that the government will need most or all the country's production, it will be wise to figure on going without those materials and to start planning now on substitutes for them.

TO FIT THE CAR TO THE FAMILY

(*Continued from page 158*)

price. From 1925 to 1939, the typical weight increased from 2,360 to 2,920 pounds; power, from 32 to 85 horsepower. The price declined from $1,007 in 1925 to $630 in 1933, then rose to $766 in 1939. The increase in weight has been due to several factors, among them an increase in size from five- to six-passenger capacity. The specific increase was from 472 pounds per passenger in 1925 to 487 pounds in 1939. That is not much when spread over fourteen years, and is no doubt accounted for by the increase in power. But we know we are using larger frames and heavier fenders and body shells, and have added numerous features like baggage compartments, bumper guards, radios, heaters (or provision for them), and what may be summed up as a generous expansion of the gadgetry.

It looks as if improvements in detail design which would otherwise have permitted lower weight and cost have been offset by changes and additions which would reasonably accompany an advance in the standard of living. But it seems quite likely that since 1920 and certainly since 1925 the national standard of living has remained stationary or declined. The danger is that we may be making more and more a type of car which as a nation we can less and less afford. The disappearance of long-term per capita growth since 1920 may in the end be found a temporary interruption of a longer upward trend, but to count on that is to take a very distant view of the matter, for there is now no clear sign of early resumption of former rates of progress.

The increase in power has gone ahead much faster than the increase in weight and must be associated with a deliberate purpose of increasing the maximum speed. It can be shown that the increase in speed has closely paralleled the increase in the automobile fatality rate, a problem which the industry is attempting to solve in every conceivable way except to deal with its most likely cause.

The question of speed is debatable even if new-car buyers insist on the top speed they now get and are willing to pay for it with their lives. Too often the speed demanded by one costs the life of another. In speed, as in other qualities, the automobile industry has shown a disposition to cater to the new-car buyer at the expense of the second, third, and fourth owners, and of those who do not own a car. If present maximum speeds were necessary, or even occasionally useful, the evident reluctance to curtail them would be more readily defensible. Better roads and better (*Continued on page 172*)

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TO FIT THE CAR TO THE FAMILY

(*Continued from page 170*)

vehicle and traffic regulations have helped. Safety glass and steel tops apparently have not. Although the contrary is often blithely assumed and asserted, newer (faster) cars have a greater tendency to be involved in serious accidents than do older (slower) cars.

The price trend is much more difficult to judge. The usual index of price per pound is unacceptable, for reasons already mentioned, and the same is true of price per horsepower and price per passenger. The price question is complicated, of course, by changes in the general price level, which was 24 per cent lower in 1938 than in 1925. In the intervening years, automobile prices fell in almost exactly the same proportion. At first glance there is nothing remarkable in the price trend. If satisfactory adjustment could be made for the undeniable improvement in the technical quality of the article, a downward trend of real automobile prices could be measured. But price is only half the story. What of costs of operation, and total costs?

In order not to burden the discussion with elaborate proof, let us assume that total costs in average circumstances may be measured, accurately enough for engineering purposes, by four variable factors — price, weight, useful life, and an interest rate — along with a constant element. It is also necessary to assume that total cost is a better criterion of efficiency than is price alone.

Weight closely reflects the principal costs of operation, such as fuel, tires, brake linings, and other repair parts. The constant element corresponds with more or less fixed items of operating cost, like license and registration fees, storage, cleaning, and certain kinds of insurance, to the extent that they are the same for all types of cars. The interest rate and the useful life help to balance operating costs against purchase price. Obviously, a more expensive but more durable and more economically operated article may be cheaper over all than one which costs less in the beginning but eats its head off later.

Statistical methods are available for analyzing total costs in such a way. One attempt, which assumed constant car life and interest rate, thereby reducing to two the number of variables in the formula, yielded, in reciprocal form, the following index of economic efficiency:

$$E = \frac{100}{.2 + .0002W + .0003P}$$

where

E = efficiency in per cent
W = shipping weight in pounds
P = retail price in dollars.

This formula gives an arbitrary rating of 100 to a $750 car weighing 2,875 pounds, roughly the typical 1938 model.

If the weight were reduced to 2,000 pounds and the price increased to $1,330, the economic efficiency would remain the same. If the price were then made $1,000, the efficiency would be increased 11 per cent. On the other hand, if the attempt to increase the efficiency of the car were confined to bringing down costs of manu-

facture, a 2,875-pound car would have to be priced at $417 in order to compete on an equal economic footing with a 2,000-pound, $1,000 car.

Even so crude a formula as this is bound to be a better guide than any consideration of price in the raw. It permits a number of interesting, if tentative, conclusions: The economic efficiency of the 1938 automobile may have been as much as 27 per cent less than that of the 1925 car (under 1938 conditions). This is no doubt an exaggeration, but it emphasizes the inherent poor economy of current designs. The optimum price per pound required by present conditions is probably much higher than the 25-cent figure which characterizes the principal offerings of the industry today.

Because of the importance of the constant element in costs, it will not pay to reduce the size of the vehicle to correspond exactly with various sections of the potential market. There probably would be little merit in a project designed to meet directly the demand for a two-passenger car. This is one reason for the repeated failure of midget cars in the American market. Opportunities for improvement seem to lie more clearly in reducing weight than in lowering manufacturing costs. Lighter automobiles might command appreciably higher prices than do the existing designs. They certainly would do so in the secondhand market.

Although the influence of durability, interest rates, and wage rates is not reflected directly in the formula, it is possible to make some qualitative observations with at least the hope of more than usual accuracy. A lighter car would be expected to have a longer economic life than a heavier car. It is difficult otherwise to account for the tenacious existence of relatively large numbers of Model T and Model A Fords. Durability, it seems, should be sought in lightness, even if individual parts must be somewhat more frequently replaced.

From a narrow point of view, a more durable car, requiring less frequent replacement *in toto*, might seem to have unfavorable implications for the industry as a whole. But long life could not become a matter of serious concern until the existing stock of 25,000,000 cars had been largely modernized. By that time, economic conditions might require again a different type of car. There is some evidence now of an increasing average car life, but it is probably due partly to general business conditions and partly to the possible purchasers' feeling that there is not a great enough difference between old and new cars to warrant the replacement of the former at earlier rates.

Increasing wage rates have required important changes in methods of production, which are reflected in the design, and have likewise caused changes in maintenance methods and the provisions made for repair operations. But there the situation is somewhat different. Service-station wage rates have increased and the use of special service tools has grown; outside the service stations, however, wages are lower than they were, because of wider lack of formal employment and the greater amount of leisure time. This "unemployed" labor works for itself and its neighbors at almost ridiculously low wages. No special provision has been made in current designs for maintenance by the individual owner using simple tools and having time to burn. The tendency has been in the opposite direction. Some of our cars cannot be given even light repairs outside a well-equipped shop.

A decrease in interest rates would favor, according to the foregoing analysis, the use of higher-priced, lighter designs. Interest rates have been declining for several years, and may remain below normal for several years to come, but changes in automobile designs have run directly counter to this influence. (*Concluded on page 174*)

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TO FIT THE CAR TO THE FAMILY

(*Concluded from page 173*)

In summary, recent economic changes have included a smaller family unit, a stationary standard of living, an increasing accident frequency, and declining interest rates. These changes suggest smaller, lighter, slower automobiles, of higher specific price. Actual designs, however, have become larger, heavier, faster, more luxurious in appearance, and lower in specific price.

Returning now to the conclusions indicated on functional grounds, we see they are quite consistent with economic tendencies. Both lines of thought appear to favor emphasis on the four-passenger size, an effort at weight reduction through structural rearrangement, and a willingness to admit considerable increases in costs per pound in achieving these objectives. The task will be made easier if we agree that a small sacrifice in top speed is tolerable.

THE INSTITUTE GAZETTE

(*Concluded from page 162*)

concerning graduate scholarships and the administrative status of the Course have already been carried out.] Investigation of the formation of ice on planes in flight, possible remedies, and the hygrometric and temperature conditions under which ice formation occurs were discussed by the Committee. [A program of research on this subject was initiated at the Institute in co-operation with the National Academy of Sciences with financial support from the United States Army.]

THE TREND OF AFFAIRS

(*Concluded from page 147*)

that energy on the storage principle, moreover, it might be possible to work up a combination of low-temperature radiant heat for the dark hours with direct solar heat for the day hours, at least in rooms facing in the right direction. The former possibility might be fundamentally an engineering adaptation; the latter might be fundamentally an architectural approach.

It is also possible to control the sun in the summer much better than we now do it. Shades and Venetian blinds will both work much more efficiently outside the window than inside it, a fact which might suggest a major architectural change. For a specific building, it is possible, depending on latitude and orientation, to create canopies of shapes which will let in a maximum of sun in winter and keep out a maximum in summer. Here is further chance of creating new architectural forms.

In this new pursuit of the sun, it is to be hoped that neither solution may run riot. To use some of the excessive architectural interpretations indiscriminately would be a great pity; it might be greater pity if engineers working in this field let themselves be shackled by any preconceptions about what kind of architecture may be regarded as acceptable. Of the two dangers, the latter, in view of the general public attitude, is by far the more imminent.

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TECHNOLOGY MEN IN ACTION

CHECK LIST OF THE ACTIVITIES AND ACHIEVEMENTS OF M.I.T. ALUMNI AND OFFICERS

Express to Top

¶ CHARLES EDISON '13 became secretary of the Navy on January 2. Said the press: "The great navy defense program, involving the expenditure of hundreds of millions of dollars, was entrusted to Edison, who has been primarily the administrator and the business executive of the navy ever since he took office [as assistant secretary]. . . ."

Final Returns

¶ A. A. POTTER '03, named chairman of the committee on engineering schools of the Engineers' Council for Professional Development, succeeding KARL T. COMPTON, President. Other members for 1939–1940: EDWARD L. MORELAND '07, JOSEPH W. BARKER '16, and JAMES R. KILLIAN, JR., '26.

¶ HAROLD S. OSBORNE '08, elected vice-chairman of the council of the American Standards Association; RUFUS E. ZIMMERMAN '11, re-elected vice-president of the association.

¶ JEROME C. HUNSAKER '12, reappointed to the National Advisory Committee for Aeronautics.

¶ TENNEY L. DAVIS '13, elected by the American Association for the Advancement of Science to the committee on historical sciences; KARL T. COMPTON, President, to the executive committee of the association's council; GEORGE R. HARRISON, Staff, to the committee on physics; GEORGE SCATCHARD, Staff, to the vice-presidency of the section on chemistry.

¶ PER K. FROLICH '23, elected a councilor at large of the American Chemical Society.

¶ JOHN H. PERRY '23, named a director of the American Institute of Chemical Engineers.

¶ HAROLD E. EDGERTON '27, awarded first prize for his photograph, "Bullet Through Glass" (see The Review, November, 1938, page 8), in the scientific classification of the *U. S. Camera* competition.

A.S.M.E. Honors

¶ For CHARLES T. MAIN '76, honorary membership (see '76 class notes).

¶ For RUPEN EKSERGIAN '14, the Worcester Reed Warner Medal "for influential papers of permanent value in the A.S.M.E. *Transactions*." DUGALD C. JACKSON, Emeritus, presented his former pupil for the award.

Quoted and End Quoted

¶ Before the chemical engineering symposium of the American Chemical Society in Ann Arbor, Mich., December 28 and 29: ROBERT V. KLEINSCHMIDT '18, on "Factors in Spray Rubber Design"; EDWARD W. COMINGS '34, on "Thickening Calcium Carbonate Slurries"; JOHN E. LYNN '37 and ERNST A. HAUSER, Staff, on "Separation and Fractionation of Colloidal Systems."

¶ Before the production conference of the American Management Association in Chicago, November 15 and 16: WILLARD C. BROWN '16, on artificial lighting; RAYMOND S. PERRY '20, on industrial preparedness.

¶ Before the symposium on temperature of the American Institute of Physics in New York City, November 2, 3, and 4: WALTER P. WHITE '92, on "Potentiometers for Thermoelectric Measurements"; CHARLES G. ABBOT '94, on "Smithsonian Temperature Measurements"; CHARLES-EDWARD A. WINSLOW '98, on "Man's Heat Exchanges with His Thermal Environment"; ROBERT B. SOSMAN '04, on "The Education of a Pyrometrist"; LUIS DE FLOREZ '11, on "Practical Considerations Concerning Temperature Control"; NORMAN L. BOWEN '12, on "Geologic Temperature Recorders"; RALPH B. KENNARD '13, on "Temperature Distribution near Heated Surfaces by the Interferometer Method"; JAMES A. BEATTIE '17, on "The Thermodynamic Temperature of the Ice Point"; FREDERICK H. NORTON '18, on "Pyrometry in Connection with Creep Tests"; FREDERICK A. BROOKS '20, C. E. Barbee, R. L. Kepner, and Coby Lorenzen, Jr., on "Fast Single-Curve Recording of Multiple Thermocouple Measurements of Soil and Air Temperatures"; EARNSHAW COOK '22, on Experimental Comparison of Pyrometric Methods for Liquid Iron in the Foundry"; BERNARD LEWIS '23, and Guenther von Elbe, on "Flame Temperature"; ERNEST W. THIELE '23 and W. B. Kay, on "The Significance of the Critical Temperature of Mixtures"; CHRISTOS HARMANTAS '25, on "Radiosondes in Obtaining Air Temperatures"; CYRIL STANLEY SMITH '26, on "Measurement of Specific Heat of Metals by Thermal Analysis"; EVERETT D. HOWE '27 and L. M. K. Boelter, on "Instruction in Temperature Measurement to Mechanical Engineering Students"; B. EDWIN BLAISDELL '32 and JOSEPH KAYE '34, on "The Location of the Sulfur and Mercury Boiling Points on the Thermodynamic Temperature Scale"; HORACE R. BYERS '32, on "Upper-Air Temperatures and Their Significance in Air-Mass Analysis"; V. LAWRENCE PARSEGIAN '33 and C. O. Fairchild, on "Performance Characteristics of Recording Potentiometers"; JACK DELMONTE '34, on "Temperature Measurements and Temperature Control in Plastic Molding Industry"; PAUL WING, JR., '34, and N. A. Miller, on "High Speed Temperature Measurement in Petroleum Refining"; JOHN CHIPMAN, Staff, on "Some New Measurements of the Melting Point of Iron and of Ferrous Oxide"; FREDERICK G. KEYES, Staff, on "The Gas Thermometer Scale Corrections Based on an Objective Correlation of Available Data for Hydrogen, Helium and Nitrogen."

DEATHS

* *Mentioned in class notes.*

¶ GEORGE O. CARPENTER '73, December 2.

¶ WALTER E. TRUFANT '84, December 3.

¶ CHARLES CUTLER '94, December 6.

¶ ROSE HARDWICK '94, December 2.

¶ EDWARD STURGIS '94, December 10.

¶ L. EUGENE EMERSON '96, December 17.*

¶ ALBERT J. WELLS '96, August 29.

¶ HUGH K. MOORE '97, December 18.

¶ JACOB B. REINHARDT '05, November 11.*

¶ CHESTER COLSON '08, December 5.

¶ CHARLES OSBORN '20, October 30.

¶ WILL R. AMON '22, December 10.*

¶ EDWARD WELLS '25, November 27.*

¶ BERNARD R. MURPHY '27, May.

¶ STANLEY S. SEYFERT '32, December 11.

¶ HENRY G. PEARSON, Emeritus, December 28 (see the Institute Gazette).

NEWS FROM THE CLUBS AND CLASSES

CLUB NOTES

M.I.T. Association of Buffalo

The December meeting was held on Saturday, the ninth. A total of about eighty people gathered for lunch at the Colonial Kitchen Restaurant in Lackawanna. Following luncheon, the Treasurer gave a brief report indicating that the Club is still slightly in the black.

John M. Gaines, Jr., '26, President, introduced the speaker, James A. Creighton '14, who is superintendent of the No. 1 open hearths at the Lackawanna plant of the Bethlehem Steel Company. Mr. Creighton briefly presented the high lights about the plant we were to see. We then started from the main office of the Bethlehem plant, visiting first the newest bank of open hearths. Each one in this group of ten has a capacity of 175 tons of steel. We were just in time to see one of the furnaces tapped. The last place visited was the strip mill; the machinery and process of this new plant were explained in full. Everybody reported an enjoyable afternoon.

A number of Alumni who are now working for Bethlehem were among the guides who helped to explain the processes and the points of interest as well as to answer the numerous questions. Among them were Wilfred MacDonnell '34, Carl F. Norbeck '29, and George A. Akin '38. The latter is in charge of the Buffalo Station of the School of Chemical Engineering Practice. — JOHN D. RUMSEY '33, *Secretary*, Chevrolet Motor and Axle Plant, Station B, Buffalo, N.Y.

Technology Club of Chicago

Our season opened with a dinner and smoker on December 4 at the Hotel Knickerbocker, under the guidance of the smoker committee, which consisted of H. Felton Metcalf '22, chairman, John Drum '26, Goodwin de Raismes '37, Elmer D. Szantay '35, Trevor K. Cramer '30, and Leo C. McEvoy, Jr., '38. Samuel C. Prescott '94, Dean of Science at M.I.T., our welcomed guest speaker, gave us a firsthand account of his Department's work in biophysics and biological engineering. One hundred and forty-four Alumni were present. — Plans are being made for our third annual meeting for President Compton. — EDMUND G. FARRAND '21, *Secretary*, 1200 Old Colony Building, Chicago, Ill.

Rocky Mountain Technology Club

Although the Club has had monthly meetings in the past, no reports of these have been sent to The Review. We hope to fare better in the future by passing along reports of our activities. The final meeting before summer recess was a banquet at the University Club at which time two candidates for M.I.T. scholarships were interviewed. The regional scholarship was awarded to Frank E. Briber, Jr.

The first meeting of the fall was held at the home of Severance Burrage '92 on November 3. Isadore Silverman '28, who finished the 1938–1939 year as president because of the absence of Alvah Moody '17, regular President, was elected president for 1939–1940, and Edward M. Fischer '37 was elected secretary-treasurer. After a brief business meeting and discussion of events of the summer months, Dr. Burrage talked informally on algal growth at Glenwood Springs, Colo. The social part of the meeting was spent in card playing and reminiscing over the summer months. A delightful luncheon, à la Halloween style, was served.

Those present were Milton H. Kauffman '91, Severance Burrage '92, Orren Allen '93, Harold O. Bosworth '02, Clifford R. Wilfley '06, Edward B. Sebben '16, Fred P. Baker '19, Benjamin V. Howe '26, Howard N. Lary '27, Isadore Silverman '28, Anthony J. Perry '29, Charles H. Behse, Jr., '32, M. Jack Bernstein '34, Edward M. Fischer '37, and Allen I. Williams, Jr., '37. — EDWARD M. FISCHER '37, *Secretary*, 1285 Clarkson Street, Denver, Colo.

Technology Club of Milwaukee

James R. Killian, Jr., '26, Executive Assistant to President Compton and former editor of The Review, was our distinguished guest at a dinner meeting on December 15. We were most fortunate in having so well informed a man as our guest, for he was able to tell us little-known facts regarding the Institute, especially those dealing with finances. Mr. Killian had hoped to get the ten o'clock train to Chicago, but we let him get away only in time to get the twelve o'clock train — an indication of the interest his visit aroused. Mr. Killian was also kind enough to bring slides showing views of the Technology buildings and equipment, particularly the newer buildings and research facilities. The transformations are amazing to behold, even to those of us who have been away for a very short time.

We were glad to have three Alumni from Madison at this meeting. It was decided to make an effort in the future to get our out-of-town members to Milwaukee for our meetings. Graham Walton '30 has agreed to act as a sort of clearing-house for information and transportation for our Madison Alumni. Although we have made an effort in the past to keep our Milwaukee mailing list up to date, no similar effort has been made so far as other towns and cities in the Club's district are concerned. Our out-of-town addresses are therefore probably sadly out of date. We shall appreciate hearing from all Alumni in this region who didn't receive notices regarding the December meeting. A special committee is planning a party to which Alumni may bring feminine guests. The exact date has not yet been set, but it will probably be on a Friday night in March.

Those from Milwaukee who attended our December meeting were John B. Ballard '35, George F. M. Chase '38, Philip N. Cristal '17, Louis O. French '10, Leon J. D. Healy '09, Maurice D. James '27, David V. Nason '13, Robert M. Osborn '36, David G. Smith '31, Lemuel D. Smith '06, Harry H. Valiquet '03, Bruno H. Werra '32, and Julius W. Werra '22. The three from Madison were Jonathon B. Cobb '37, Thomas G. Harvey '28, and Graham Walton '30. — ROBERT M. OSBORN '36, *Secretary*, 2840 West Highland Boulevard, Milwaukee, Wis.

M.I.T. Club of Northern New Jersey

The fall smoker was held at the Newark Athletic Club on November 16. The attendance was 164, of whom thirty-six were present for the Dutch treat dinner beforehand. Sports were the subject of the evening, and the so-called staid engineers rallied to the thrill of football, baseball, and hockey. Fred Bendel, sports writer for the Newark *News*, told about the big names and the big games, illustrating his talk with movies of the actual events. To top off the evening Jules Andre, a noted skier, showed us some truly fascinating colored movies of skiing, taken both here and abroad. Beer, coffee, cider, and all the other fixings comprised the refreshment part of the program.

The annual beer party will be held early in February. If you live in northern New Jersey and are not regularly receiving notices of these Technology Club affairs, let the Secretary know without delay to insure your receiving notification of the February party. — CLAYTON D. GROVER '22, *Secretary*, Whitehead Metal Products Company, Inc., 303 West 10th Street, New York, N.Y. FREEMAN B. HUDSON, JR., '34, *Assistant Secretary*, Colgate-Palmolive-Peet Company, 105 Hudson Street, Jersey City, N.J.

Technology Club of Philadelphia

The Club held its first meeting of the current season at the Hotel du Pont in Wilmington, Del., on December 6. Approximately 150 members turned out to listen to Dr. Compton. Walter Beadle '17, President, announced that new officers would be elected at the next meeting, and Phil Alden '22, Secretary, read a letter from one of the oldest members, J. A. McIlvaine, Jr., '96 of Germantown, Pa.,

who wrote that although he had ceased attending meetings because of total deafness, he always read the notices and wanted to assure us that he was present in spirit.

Chaplin Tyler '23 of the Du Pont Company announced that the Wilmington Alumni had organized a luncheon club which meets every Monday at 12:30 at McCorkles Restaurant, 9th and Market Streets, Wilmington. Attendance at these luncheons is running better than twelve or fifteen weekly, and all visiting M.I.T. Alumni are invited to come without special invitation or introduction. The officers and executive committee tendered a luncheon on December 27, at the Engineers Club, to the undergraduate students who were home for the Christmas holidays.

President Beadle introduced Dr. Compton, who was given his usual enthusiastic reception and who outlined some of the more interesting activities going on in the Institute, reporting that 2,379 undergraduates and 721 postgraduate students are enrolled in the Institute this year. The latter figure has grown from practically nothing in 1921 to its present size. Dr. Compton pointed out that the Institute now has the highest tuition fee of any of the major colleges or universities in this country and that whereas tuition is now $600, the actual cost is $780 for an undergraduate and $1,063 for a graduate student. The new swimming pool, financed by Alumni, will, he said, probably be opened on Alumni Day, June 3. A much closer relationship holds between the Faculty and the students, Dr. Compton observed, and the student supper clubs are increasingly popular. — PHILIP M. ALDEN '22, *Secretary*, 1000 Chestnut Street, Philadelphia, Pa.

Washington Society of the M.I.T.

The Society held its December meeting on Friday, the fifteenth, at five o'clock at the Young Women's Christian Association. The executive committee had decided that a new location at a lower price might be of interest to many of the members, and apparently this decision was correct, because we had an attendance of sixty-three, including many faces we had not seen for some time. In the absence of our Honorary Secretary, Henry D. Randall, Jr., '31, who showed up a little late, Ed Merrill '09, our President, introduced Proctor L. Dougherty '97, who remarked upon the recent sickness of Clayton Denmark '07 and his return home from the hospital. Denmark is chief engineer of the new National Museum. A motion authorizing the sending of flowers was made and duly passed.

Mert Emerson '04 next made a few remarks. As one of the few remaining members of the original Alumni Council, he admitted that he had asked for election this year. Mert visits Boston about once a month and promised to do his best to represent us properly at Cambridge. — Dougherty, in a postscript, invited the members of the Society to attend an evening of magic conducted by Fred Untiedt '22 at the National Press Club later in the evening without charge.

President Merrill introduced Horace E. Weihmiller '25, Vice-President of Consolidated Aircraft Corporation, who was instrumental in bringing our principal speaker, John H. Jouett, President of the Aeronautical Chamber of Commerce of America, a man with considerable experience in aviation matters for the United States Government and with experience in the past as adviser to Chiang Kai-shek. Colonel Jouett's remarks covered air progress since 1903 when Orville Wright made the first successful flight, lasting 12 seconds, in a motor-driven 12-horsepower flying machine at Kitty Hawk. Jouett listed the remarkable development of aviation — slow but steady for the first ten years, accelerated by the World War, aided by remarkable improvements in the Twenties, and increasing each year steadily but with greater utility.

Although the airplane is an implement of death, it is also one of mercy, as he illustrated. While not over a score of people had flown in the United States in 1904, over one and three-quarters million flew in scheduled transportation in 1939. Advances listed were increases in speed, from 35 miles to 469 miles an hour; in altitude, from 82 feet to 56,000 feet; in duration, from 21 seconds to 84 hours, or 7,158 miles, without refueling; in tonnage, to 41 tons at present, with 120-ton Boeings now being planned; and in licensed pilots, to 30,000, an elevenfold increase in personnel in the last twenty-two years. American industry will not overexpand, he said. No aviation concern is expanding until it can see amortization of the investment on the basis of one contract and is carrying no large inventory. Factories are turning out twenty million dollars' worth of production a month (by midsummer will be turning out fifty million) and have six hundred million on order. There is no doubt that this country produces better planes than any other. We export twice the number of planes of all other countries and have gone farther than others in the application of metallurgy and in uniformity of construction. More than double the amount of profit made by the aviation industry has gone into research in the last five years.

Following this talk, Joe Houghton '26 was introduced as a new papa, now the father of a second son. By this time Consolidated Aircraft was ready with its remarkable picture of the PBY navy plane. The picture is entitled, "Building the Navy's Wings," and Consolidated, the firm which produced it, has 200 navy bombers — the largest single order ever placed; a factory employing thousands, with three square miles of floor space, using modern manufacturing methods involving destructive tests, machine production, and interchangeability. Details of all of the production processes were demonstrated, and we saw the finished product on the ground and in the air. Following the meeting Ed Merrill expressed his thanks for the excellent talk, the wonderful picture, and the good food furnished by the Y. The practically unanimous desire of those attending was to have future gatherings at this location.

The following M.I.T. men and guests enjoyed this outstanding meeting: John H. Jouett, guest speaker, George W. Stone '89, William B. Poland '90, Frederick W. Swanton '90, Joseph W. Clary '96, George E. Stratton '96, Frederick A. Hunnewell '97, Martin Boyle '98, Charles H. Stratton '00, John Boyle '01, Merton Emerson '04, Amasa M. Holcombe '04, Henry L. Lyman '04, Frank W. Milliken '04, George N. Wheat '04, Paul A. Blair '05, John C. Damon '05, Ben E. Lindsly '05, Ralph E. Tarbett '05, Louis H. Tripp '06, Phil P. Greenwood '07, Edwin Hahn '09, Edward D. Merrill '09, Kenneth P. Armstrong '10, Richard W. Cushing '11, Charles P. Kerr '11, Frank L. Ahern '14, and Alfred E. Hanson '14.

Also, Sarkis M. Bagdoyan '15, Frank E. Richardson '16, Horace M. Baxter '17, William C. Mehaffey '17, Al F. O'Donnell '19, George W. Anderson '20, Lawrence W. Conant '21, Perry R. Taylor '21, George R. Hopkins '22, Lester C. Lewis '22, William K. MacMahon '22, Robert K. Thulman '22, Paul J. Culhane '23, Edmund S. Pomykala '23, Harry B. Swett '25 with Commander Briscoe as his guest, Horace E. Weihmiller '25, Joseph Y. Houghton '26, Karl French '26, Thomas A. Knowles '27, Frederick W. Willcutt '27, Albert F. Bird '30, Jules A. Larrivee '30, David S. Stanley '30, Samuel Bensinger '31, Mario V. Caputo '31, Henry D. Randall, Jr., '31, Frederick M. Moss '32, Robert H. Macy '33, Alfred H. Munson '33, John T. Cheney, Jr., '35, Utley W. Smith '35, Allen C. Stephen '36 with David A. Werblin '36 as his guest, Edward U. Corea '37, John Lowe, 3d, '37, and Richard L. Steiner '39. — ALFRED E. HANSON '14, *Secretary*, 3424 Quebec Street, N.W., Washington, D.C. WILLIAM K. MACMAHON '22, *Review Secretary*, 818 25th Street, South, Arlington, Va.

CLASS NOTES

1876

Seldom does the Secretary have any news for publication in The Review. It may interest the few remaining members of the Class to learn that the Secretary has recently been elected honorary member of the American Society of Mechanical Engineers and to know something about this honor. The total membership of the Society is about fifteen thousand. It was incorporated fifty-nine years ago, and your Secretary joined fifty-five years ago. During this period, seventy-six honorary members have been elected, of whom only sixteen are now living. Our former Secretary, John R. Freeman, was president of the American Society of Mechanical Engineers in 1905 and was elected honorary member in 1932, the year of his death. Your present Secretary was president during the war year of 1918. — CHARLES T. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass.

1893 Continued

from New York that evening at midnight. Arriving in Germany he was fortunate in having old friends in high station who introduced him to Göring. The acquaintance thus begun led to visits to Göring's Berlin residence and to his country home some thirty miles outside that city. Armed with letters and passes from Göring and from a ranking Gestapo official, Waitt had the rare opportunity of visiting Helgoland and seeing, in all its detail, this modern German fortress.

His experiences were described at length in articles by him published last fall in the Boston *Globe*, from which is taken the following description of Germany's counterpart of Gibraltar: "During the last war of 1914–18, Germany was powerful enough to hold the Baltic from invasion. Her navy was infinitely stronger than it is today and with Heligoland as a base she held off the might of the British Navy. Today Heligoland commanding the approach to Bremen, Hamburg and Brunsbuttel at the western end of the Kiel Canal, is more strongly fortified than ever before and is the key position of defense of all the north German ports. As the ocean traveler approaches Bremen or Hamburg he passes on the right the East Frisian Islands, a number of long low lying sandy islands off the north coast of Germany and upon entering the channel in Heligoland Bay he sees the blinking light of Heligoland Island on the right. Here the shallow sand shoals and mud flats on either side confine navigation to a comparatively narrow channel commanded by the guns on Heligoland Island. The island is of red sandstone and sticks up out of the sea a couple of hundred feet high, and these perpendicular red cliffs can be seen many miles out to sea.

"In 1936 Hitler, in direct contradiction to the Versailles Treaty, undertook the task of re-arming the island and he has done an excellent job. He sent 70 of his best engineers and a small army of laborers to the island and constructed a tunnel 18 feet in diameter from tide water up through the soft red sandstone on an easy grade to the top. With the rock excavated from the tunnel he extended the breakwater, also deepened the harbor so that now the whole German Navy can ride safely at anchor behind the long jetty. The tunnel served the purpose to transport the heavy 16-inch guns brought there on lighters at tide-water level up to the upper high level where they were mounted. Deep lateral tunnels branch off to ammunition magazines safe from bombs or enemy gun fire. A narrow gage electrically operated railway conveys this ammunition to the guns above. Today the island is as impregnable as human ingenuity can make it, and with its heavy 16-inch guns, anti-aircraft guns, machine gun nests to repel landing parties, it will be the most difficult nut for the British to crack. Further protection is afforded by the German mine fields off the north of the island which have recently been placed in position. Even in the last war after the Battle of Jutland and the British fleet chased the shattered remnants of the German Navy to the shelter of Heligoland, the British turned back before their ships came within range of the guns on the island, for they had a wholesome respect for Heligoland and dared not approach too close."

Frederick D. Smith, perhaps best known by his fellow classmates of Course I, received the following write-up in his home-city paper, the Malden, Mass., *News:* "Frederick D. Smith, 25 Waverly St., retired director and chief engineer for Metropolitan Sewerage, today [November 6] is quietly observing his 76th birthday enjoying the best of health. Mr. Smith, who retired from active service at 70, busies himself every day caring for his local property about the city and his spare time is spent playing chess with friends. He is one of the best players in the city and is a member of the Chess club at St. Petersburg, Fla., where he winters. Mr. Smith attributes his good health and long life to hard work, saying that he knew nothing else but work up to the time of his retirement. He laughed at the idea of a celebration of a birthday, saying that it was just another day. He was well remembered by members of his family.

"Mr. Smith was a native of Foster, R.I., and in 1884 at that place married Sarah J. Chase and they have resided here for more than 40 years. . . . For 21 years before his retirement Mr. Smith was director and chief engineer with the Metropolitan Dept. and was in their employ more than 40 years. In his youth Mr. Smith played baseball and still likes the game. He drives his own auto. He is looking forward to his trip with Mrs. Smith to St. Petersburg, where they have spent the last six winters. They leave in January. There are two children, Mrs. Harold S. Geroy, the former Etta R. Smith of Avon, and a son Horace E. Smith and three grandchildren, Ethel G., Horace F. and Clyde Dutton Smith. . . ."

T. Morris Brown, who joined the Class in our senior year as a student in Electrical Engineering, died at his home in East Orange, N.J., July 28. Prior to coming to the Institute he had spent five years at Johns Hopkins University, where he received his B.A. degree in 1891. Upon leaving Technology, Brown entered the steel business and for five or six years was draftsman with the Walker Company of Cleveland. Following a year with the Wellman-Seaver-Morgan Company he was an electrical engineer for several years with the Brown Hoisting Machinery Company of Cleveland. Thereafter he devoted himself to salesmanship, being successively salesman for the Ingersoll-Rand Company of Cleveland and St. Louis, for certain steel companies, and for such companies as the Lamson Company and the All American Electric Maintenance Corporation of New York. For many years he had lived at East Orange.

Henry M. Chadwick's death on November 27, 1938, has but recently been reported. He was with the Class only through the freshman year. On leaving the Institute he was a draftsman with, successively, a machinery concern in Boston, the Berlin Iron Bridge Company, and the New England Structural Company. From 1893 until the company went out of business not long ago, he was with the Boston Bridge Works, Inc., as draftsman, assistant chief draftsman, and assistant engineer of construction. In his leisure he gave some time to writing poems and nature sketches for various periodicals, and he published two or three volumes of verse. His home was in Malden, Mass.

William Worcester Cutler died at his residence, 401 Beacon Street, Boston, October 25. He studied Electrical Engineering with the Class but spent most of his business career as an official of the Eastern Drug Company of Boston. — Mrs. Alice M. Leeds, wife of Edmund I. Leeds, Boston architect, died at her home in Newton, October 21. Besides her husband, she leaves a son, Edmund I. Leeds, Jr., of Brighton, and two daughters, Miss Alice W. Leeds and Mrs. Elizabeth Watson, both of Newton.

The following changes of address have been received: Harley W. Morrill, 60 Dartmouth Street, Springfield, Mass.; Archibald Murray, 212 Aylmer Apartments, Ottawa, Ontario, Canada. — FREDERIC H. FAY, *Secretary*, 11 Beacon Street, Boston, Mass. GEORGE B. GLIDDEN, *Assistant Secretary*, 551 Tremont Street, Boston, Mass.

1895

Of interest, not only to our Class but to others, are the reasons given by Gerard Swope and Owen D. Young in asking for retirement from their positions with the General Electric Company. In their letter of November 17 to the board of directors, they said: "On May 16, 1922, we undertook, at your election, the offices of chairman and president, respectively, of the General Electric Company, and as a result of your designations we have held those offices ever since. When we took office we indicated our view that it would contribute to the morale and effectiveness of the organization if, as a general rule, men in important administrative positions would consider retirement when they reached the age of sixty-five. We realize that there have been, are, and probably always will be exceptions where it is desirable in the company's interest for men to continue beyond that age. Having adopted that policy of retirement during our administration, we now apply it to ourselves. We do so with no reservation, because there are younger men, whose experience and capacity have been demonstrated to you, who are now available for those offices. Accordingly, we now ask for retirement from the offices of chairman and president, respectively, at the expiration of the present calendar year. We took up these offices together and we wish to lay them down together. We will remain as directors and make ourselves available for such service as you and our successors may deem helpful to the company. May we express to you and through you to the organization our appreciation of the privilege of working so happily with you and them for these many years."

1895 Continued

Jerry is already in a new job. "There are men whom it is difficult to picture as inactive. When they retire, at whatever age, inevitably the query arises, what will they do next? Gerard Swope . . . is decidedly such a man. To use an overworked, but to him wholly appropriate phrase, he was 'a human dynamo.' It was doubtful that, even at 67, he could stop. It is good to know then that Mayor La Guardia found employment for him. Mr. Swope will be chairman of New York City Housing Authority. In his new post he will revive a long-slumbering, but real, interest in housing. One thing is certain; under Mr. Swope the office will be teeming not only with ideas but with effective action. It was his way at the General Electric and the habit is too ancient for quick change. Mr. Swope got his new job, it seems, when the Mayor on hearing of his intention to stop working, called him on the 'phone and said: 'You're too young to retire. What are you going to do?' The salary question was solved easily. Mr. Swope will get no pay whatever. After a few months' vacation, Mr. Swope will enter this vital and socially rewarding field of housing. We hope his achievements will be on par with his uncommon executive abilities and his genuine devotion to human welfare."

Dave Weston is still in Venezuela, South America, but at a new address: Compañia Anonima Central Venezuela, Bobures, Estado Zulia. — Everell Shipley Sweet has changed homes from South Braintree, Mass., to 85 Sea Avenue, Quincy, Mass. — We record the passing of Richard Hall Flint, VI, on September 29, 1938, at San Juan Bautista, Calif. — The death of Frederick Adams Woods occurred on November 5 in Rome, Italy. Dr. Woods was a noted American biologist and a scientist who played a leading role in the development of historiometry. An authority on heredity and allied subjects, he pioneered in historiometry, the science of applying exact mathematical or statistical methods to the causes and events that make up history, and was the author of two books and many technical papers on his specialty. *Mental and Moral Heredity in Royalty* was published in 1906 and was received with deep interest by scientists throughout the world. It was a study of the character and achievements of more than 3,000 ruling monarchs and their blood relations and was recognized as an important step toward putting historical records to a practical use. In 1913 a further study, *The Influence of Monarchs*, was printed. Dr. Woods settled in Rome in 1927 because of his health but contributed at intervals to scientific publications in this country. He was also an economic forecaster on cotton. He is survived by his second wife, the former Baroness Marie de Lebzeltern-Collenbach of Austria and New York, and a sister, Miss Florence Woods of Dover, N.H. — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass. JOHN H. GARDINER, *Assistant Secretary*, Graybar Electric Company, 420 Lexington Avenue, New York, N.Y.

1896

Gene Hultman received a very nice Christmas present in the form of reappointment as chairman of the Metropolitan District Commission for a term of five years; he is thus assured of getting his yearly pay envelope of $8,500 through 1944.

Two classmates — Edward L. Sturtevant and Herbert D. Newell — were recently reported by the Alumni Office as having become lost. Through the co-operation of Bakenhus, Sturtevant was relocated at 87 Waller Street, White Plains, N.Y. His business is with the Frosted Foods Sales Corporation, 250 Park Avenue, New York, N.Y. Incidentally, Sturtevant travels quite a bit as a part of his job. R. E. Cushman '06, President of the Technology Club of Oregon, came through in fine shape and reported that after a bit of sleuthing he had learned that Newell, who had been residing in Portland, was now at 615 University Avenue, Palo Alto, Calif.

Lythgoe kindly sent the Secretary a reprint of his paper, "The Cold Storage of Food in Massachusetts," presented at the tenth International Chemical Congress in Rome in 1938. This paper is very illuminating, showing the extent of the cold-storage industry today and the work of Lythgoe's laboratory of the food and drug division of the Massachusetts Department of Public Health in inspecting cold-storage food to make sure that it is palatable and proper for consumption.

In the December issue of the *Bulletin* of American Association of University Professors, the list of nominees for office was given. The following item, taken from that list, is of interest to us: "Elbridge Churchill Jacobs, Geologist, Mineralogist, Seismologist, University of Vermont. Elected to the Association 1916; Chapter Secretary 1930–37; Chapter President 1939 to date. Born 1873. S.B., 1897, M.I.T.; A.M., 1913, Columbia University. Assistant instructor, 1897–99, M.I.T.; Instructor, 1899–1903, Professor, 1903 to date, University of Vermont. Nominee for member of the Council from District 1 for 1940–42."

O. B. Denison '11 sent along a little item from the Worcester *Gazette* of November 29, telling about James H. Fuller, the son of our classmate Bob Fuller. The boy is enrolled in the college of fine arts of Syracuse University and is preparing to major in illustration. He has the honor of being one of fifty-seven students retained on the "Onondagan," the campus yearbook. He thus survived the fall cut which reduced the number to 57 and will have to run the gantlet of the spring cut when the group will be reduced to 15 junior editors. The boy is also a member of the outing club.

Con Young has reported his arrival in Fort Myers, Fla., where he and Abby will spend the winter as usual. Their trip south from Cape Cod was made a little faster this year than in the past and did not include so many stops and visits as in former years. He cut out Boston and the Class Secretary entirely and apparently by-passed Lou Morse in York, Pa., and Joe Clary in Washington. At the time Con wrote, the end of November, they had had three cold waves, during the last of which the thermometer had registered below 40 degrees for five consecutive mornings. Floridian housing construction is not like that in New England, and houses get rather cool between 4:00 and 7:00 A.M. during the cool spells. Con said significantly that two sets of flannel pajamas and four blankets, together with a hot-water bottle, are not any too much under such conditions. The major event in the life of Con and Abby was the gift of a cocker spaniel pup last May from Miss Deborah Rood, the daughter of Con's old M.I.T. roommate and intimate friend, Norman P. Rood '99. Actually, Abby picked the pup out of a litter, and the one she picked was a runt, but he turned out to be a bigger and livelier little fellow than his brothers and sisters. He weighed four pounds at the age of seven weeks last May and is now up to 28½ pounds. Apparently Con's chief occupation has been that of walking the dog, getting him housebroken during the summer and breaking him out in the fall.

Mail addressed to Reginald Norris in France has been returned with the notation "deceased." The Secretary has written to Arthur Baldwin in Paris, requesting further details if possible.

L. Eugene Emerson died on December 17. The Secretary will undertake to give a little biographical material on him in the next issue. — From Mrs. Katharine L. Barto has come additional information regarding her husband, whose death has been reported previously. Henry retired in 1911 owing to poor health, and he and his wife went to Pompey, N.Y., to live. There he was able to take some part in the town life. He was town historian, a member of the Old Camera Club and of the Citizens Club. He was also interested in Red Cross work and boating. — CHARLES E. LOCKE, *Secretary*, Room 8–219, M.I.T., Cambridge, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge, Mass.

1901

Although our records include some twenty good addresses of lady students who graced the Class, we seldom are privileged to receive any news items relating to those generally somewhat aloof companions of our undergraduate days; however, your Secretary has recently received an interesting letter from Miss Emma E. Ferris, who writes: "Each time I receive your class communications I wish I were a man and were out in the business world again. I haven't been in business since about 1921. I was at M.I.T. only one year, and I doubt if there is one man who remembers me. I think Mr. Kennard is the only one I have ever seen since. There are a few whom I remember more or less distinctly. Mr. Parrock, my seatmate in Professor Skinner's class, frequently made me laugh. This was somewhat embarrassing as we sat directly in front of the professor, who was very un-

1901 Continued

observing apparently. Mr. Bronson was very agreeable. These and you, also Littlefield and Bond, are the only ones I can recall. After all the years I just don't feel that I ever went to M.I.T. When I went there, I thought I wanted to be a teacher of mathematics but found I lacked the ability to teach. I was better as a businesswoman. However, I enjoy the class communications. It is like reading one's home-town newspaper even though one has been away so many years there is none left one ever knew."

Your Secretary remembers Miss Ferris very well and hopes to hear from her again and also from the other ladies of our Class. Although the class records do not indicate that any of our Alumnae have ever attended any of our class reunions, there would seem to be no good reason why they should not be present; we earnestly hope that on the occasion of our fortieth get-together, we may be so favored. — Ralph Stearns wrote that he enjoyed the efforts of your Secretary in preparing these notes. That was indeed welcome news; however, Ralph sent no other comments except to state that he would be mighty glad to have any of the fellows look him up either at his business address with Mead and Scheidenhelm, construction engineers, 50 Church Street, New York City, or at his home, 32 Elm Rock Road, Bronxville, N.Y.

Ellis Lawrence, for many years of the architectural firm of Lawrence, Holford and Allyn of Portland, Ore., writes that for the last two years he has acted as chairman of the National Advisory Committee on "Preparation for Practice." That is a new one to us but sounds quite sufficiently comprehensive; perhaps Lawrence will furnish further particulars. He has also served on the jury of award for the Federal competition for the selection of an architect for a large post-office building in California. Ellis states that his firm is now completing about a million dollars' worth of P.W.A. projects in Oregon and that one of his partners, W. G. Holford, is and has been for some time the Federal Housing Administration architect for Oregon. We have not heard from Holford for many moons, so judge that Lawrence may, by agreement, be the corresponding member of the firm. — Bill Blauvelt was very reticent on his data sheet, but we have just been advised that, as usual, this retired member of the Class is spending the winter at 246½ Seventh Avenue, N.E., St. Petersburg, Fla. — Fred Connolly, who states that he was only a fourth-year special student in organic chemistry under Professor Noyes '86 and who now is a practical druggist at 1434 Dorchester Avenue, Dorchester, Mass., writes that he is teaching practical pharmacy and chemistry in the College of Physicians and Surgeons. He also taught the same subjects at Franklin Union for twenty-three years prior to 1936. Fred is evidently somewhat older than the other members of the Class, for he adds the especially interesting comment that his wife and he had just been celebrating their 50th wedding anniversary by a family dinner at the Hotel Somerset, Boston. The occasion must have been a notable one. There were present two sons with their wives, two daughters with their husbands, and five grandchildren, as well as two children of Joel I. Connolly '16. Anyone may well be proud of such a fine record.

Arthur Jewett, II, of 5420 Plainfield Street, Pittsburgh, Pa., briefly noted that he was not busy at present, and we judge that he might like to hear from any of the fellows who know of any opening in which he might be interested. — Al Higgins, President of the Florida Power Corporation at St. Petersburg, has sent in a very interesting brochure with many illustrations describing the Inglis and Dunnellon generating stations in Florida. Al has a right to be proud of those plants and unquestionably would be glad to take any members of the Class on a visit of observation if they are so fortunate as to visit Florida this winter. — O. S. Stockman, III, from whom we have not heard for some time, briefly states that he is assistant secretary of the Armstrong Cork Company at Lancaster, Pa. — Langdon Pearse, who has also been rather uncommunicative for some years past, advises that he is sanitary engineer to the Sanitary District of Chicago, with his office at 910 South Michigan Avenue. Langdon states that he resides in the same village (Winnetka) as Phil Moore and that he occasionally runs into Frank Puckey, whom he describes as a busy architect and an ardent golfer. Puckey should, therefore, show up at the fortieth reunion, in order to contend with the numerous other famous golfers of the Class. Pearse stated "that the Sanitary District of Chicago recently put in operation the largest activated-sludge sewage treatment works in the world — known as the Southwest — with a flow around 400 to 600 million gallons a day. The solids, handled by a novel flash-drying system, can be burned in air suspension or, when dry, withdrawn for sale as fertilizer."— Bob Williams, our former Secretary, regrets that he could not have been present at Alumni Day last June, but I judge that he is definitely planning to be present next year and also at our fortieth reunion. Bob must be very busy right now as special inventing and designing engineer for the Submarine Signal Company.

Since we reported in the December Review the sudden death of William Jordan Sweetser, professor at the University of Maine, we have received some further information regarding the important engineering associations of which he was a member. They comprised the American Association for the Advancement of Science, the American Society of Mechanical Engineers, the Society for the Promotion of Engineering Education, the Newcomen Society, and the Maine Association of Engineers. Bill was also a member of the Penobscot Country Club of Bangor and, as we will all recollect from past reunions, was one of the ardent golfers of the Class. We shall surely miss him at the time of the next reunion.

The Alumni Office has furnished the following changes of address: LeRoy M. Backus, 1155 California Street, San Francisco, Calif.; Richard E. Dow, 50 North Street, Hamburg, N.Y.; Harry P. Parrock, care of J. M. Benson, 142 Pleasant Street, Brookline, Mass. This last-named change of address will mean, we surely hope, that we will have a chance to see Perk once in a while, now that he has returned East from the Pacific Coast. — ROGER W. WIGHT, *Secretary*, The Travelers Fire Insurance Company, 700 Main Street, Hartford, Conn. WILLARD W. Dow, C.P.A., *Assistant Secretary*, 20 Beacon Street, Boston, Mass.

1902

The following letter from Dan Patch is self-explanatory. Although offered as 1902 news, it gives news of other Technology men whom many of the Class know: " . . . I was yarning with a couple of M.I.T. men on a trip to Maine the other day, and told them of seeing Miss Weld out in California. They wanted to know why I didn't send such news to The Review, which they both seem to read real religiously. I recalled having written to you of my trip East from Los Angeles and so I looked up the back numbers of The Review, but I could find no mention of this letter. I reckon you put it up behind the clock, and it would be old news to dig it up today.

"I returned via Canadian Pacific, and at Carmel, Calif., I had a mighty pleasant visit with Lydia Weld. She was taking an active part in the political educational program of the League of Women Voters and was trying to convince the dear old folks that there would be no gold from 'them thar hills' unless someone dug it out, and that $30 every Thursday was economically unsound. At Frisco I talked with Walter Leland '96, who said he had joined the white-cane brigade, meaning he has lost his sight. At Portland, Ore., I talked with Ellis Fuller Lawrence '01; at Seattle I called Everett O. Eastwood but found him out. Recently in Buffalo I had a visit with Nat Patch '01 and Frank Lane. Nat has also joined the white-cane brigade but still carries on courageously.

"At Cincinnati I found no '02 men but had more or less intimate contact with Rudolph Tietig and Walter Lee, both '98, who are associated in a well-run architectural and engineering business. Tietig pulled from a drawer in his desk a photograph in which I found Atherton Tucker '98 who was leader of the glee club when I joined it in my freshman year. I also had a pleasant meeting there with Walter Rapp '00. Passing through Pittsburgh I visited the Mellon Institute under the guidance of Frederick Adams '21. At Toledo, I dined pleasantly with Archie Gardner and his delightful family. On a business trip to Newburyport, Mass., I called on Walter P. Davis '01, who was a fellow warbler in the glee club. This week I got Grant Taylor to take me down in the big hole which is to be the parking space under the new building of the New England

1902 Continued

Mutual Insurance Company and speculated as to whether I would ever get any more dividends on my policies."

We looked behind our clock and also in the files but found no other letter giving the same items, and we suspect that these are just more items that Patch has dug up from his memory since the previous letter. — BURTON G. PHILBRICK, *Secretary*, 246 Stuart Street, Boston, Mass.

1903

Seneca Porter Brown, office manager for the George A. Fuller Company, Boston contractors, died suddenly of a heart attack in Springfield, Mass., on November 2 while on a supervising trip for the company. A native of Plymouth, Mass., he was graduated from the Mechanical Engineering Course, and at the time of his death was living in Braintree. The sympathy of the Class is extended to his widow.

J. Tyrrell Cheney, II, of New York City was married to Mrs. Harriet Lee Jackson on August 26. Cheney's first wife died some nine years ago. — Henry Fitzler, XIII, has been transferred from Camden, N.J., where he was inspector in the marine department of Socony-Vacuum Oil Company, to the New York office, 26 Broadway, where he is a marine engineer. — Myron Clark, V, gave a series of eight discussion talks at Boston University during November and December, on "Human Values in the Business and Industrial Enterprise of Today." — Frederic C. Hirons, IV, has been named one of the judges for the 32d annual Paris Prize architectural competition next summer. We wish more news of interest might come in to us direct. It is not so pleasant to be able to record mainly deaths. Can't we hear some joyful news from some far corner of the earth, from some long-lost member of the Class? — FREDERIC A. EUSTIS, *Secretary*, 131 State Street, Boston, Mass. JAMES A. CUSHMAN, *Assistant Secretary*, 441 Stuart Street, Boston, Mass.

1905

Evidently some cosmic influence (see Harry Wentworth) told someone that we had written a story about Tom Osgood for the January Review, for we have received from an anonymous source a later chapter of Tom's life. Here it is: "Tom W. Osgood, III, who has been located in the West for many years, has recently moved to the East. At the present time he is located at the New Hoffman Hotel in Bedford, Pa., on the job of chief safety engineer for the Pennsylvania Turnpike Commission on the construction of the Pennsylvania superhighway. This commission has its headquarters in Harrisburg, Pa. The project is 160 miles in length with four 12-foot traffic lanes of hard-surface roads and two 12-foot lanes through seven miles of tunnels. Total cost: $160,000,000. Prior to this, Osgood served for five and one-half years as chief safety engineer for the Metropolitan Water District of Southern California on the construction of the Colorado River aqueduct. This was a $220,000,000 project involving 108 miles of tunnels. over 200 miles of heavy construction on the surface, reservoirs, and five pumping plants with capacity of 1,500 second-feet and an aggregate lift of 1,517 feet. For 15½ years prior to that he was assistant chief of the bureau of industrial accident prevention for the state of California, in charge of the Los Angeles office and the work of the bureau in southern California. To go back still farther, there was a period of 11½ years when he engaged in private engineering in Medford, Ore., his work consisting of municipal improvements, irrigation developments, highways, and mining." — From the West we get a report that Hallet Robbins, I, has retired again, this time to Glendale, Calif. (Box 808, if you want to write him.)

Course I keeps to the publicity front by a notice that Russell Willson, last heard from as a captain in the United States Navy, stationed at London, England, is now a rear admiral with his address in care of the Naval Department, Washington, D.C. Anchors up and hats off to the '05 rear admiral. — Gene Kriegsman for some reason or other is back in Cranston, R.I. Perhaps he cleaned up those several-million-dollar W.P.A. projects he was telling us about at Old Lyme last June. Gene doesn't explain this last jump and that's unusual from him, so this plug will probably produce a well-known volume for the next issue. — George Fuller shifts from Omaha, Neb., to Kansas City, Mo. (Public Roads Administration, Room 711, United States Court House) without notifying the Secretary when or why. — Wallace N. MacBriar, II, has apparently tired of Milwaukee and what it's got, for he bobs up at 111 West Massachusetts Street, Seattle, Wash., still with Carnation Milk. Perhaps Mac and his cows are both more contented on the Pacific.

The following letter came from an age-lost friend, Hoffman Kennedy, IV, whose present address is 105 St. Johns Road, Baltimore, Md. We had written him for years in care of Kennedy et Cie, Paris, France. He says: "Your letter of October 25 addressed to Paris reached me only a few days before I sailed for New York on the *Vulcania* from Genoa. I had intended coming on the *Statendam*, but on November 20, when I had to make a decision, the Germans were massed on the Dutch frontier and it looked as if I might not get through. The trip was uneventful, for not a boat did we see on the ocean — not even a periscope. It was rather weird at Gibraltar, where we stopped for inspection during the night, to see the gray British gunboats glide noiselessly out of the darkness into the light of the *Vulcania*. I plan to stay here for about six months. I am informed that Secretary Hull would like me to stay for the duration of the war, but that is hardly possible, unless they consent to put me on the dole. I have sent over part of my stock of antiques to dispose of here unless they have already been disposed of by the *Graf Spee* or its confreres, for I hear the shipment is wandering around somewhere on the Atlantic Ocean. My failure in the past to answer communications from M.I.T. is due to inability to realize that a letter from me could be of any general interest. Living almost constantly in Paris, I have never run across any of my former classmates except Strickland one morning in 1908 when I met him going home for lunch with an immense bagnette of bread on the Rue Notre Dame des Champs. He was just married, he told me, and studying at the École des Beaux Arts. I hardly think he will remember me, but I should like to see him if I pass through Boston before going back. I did not feel able to contribute to the building fund, for antique merchants, like farmers, never have any money — it all goes back into stock and has a way of freezing tight during world cataclysms.

"Your second paragraph was flattering but so humiliating to answer: No family (never having succeeded in getting married) and no honors, academic, political, or commercial. Just another case of arrested development, I fear. How gratifying were I able to write that, after amassing a sufficient fortune in the exercise of my profession (architecture), I had been able to devote my time to plans for the betterment of mankind and the cause of universal peace, a work recognized by the nations in bestowing on me the following decorations (follows a half page of medals and orders). The horrid truth is that my life has been devoted, in the intervals of a series of falls, to the struggle of getting a financial cushion under me before the next fall. That cushion I can now hope to find only when I fall into the golden streets through the pearly gates.

"I went abroad in February, 1913, rather stale, hoping that living in Paris and working with a French architect would freshen me up. It did; but September, 1914, put an end to that, and I worked in the American Ambulance Corps until lack of funds made me go into business and later I went into interior decorating on my own. The antique shop came later still, after I had become a fanatic in acquiring antique furniture for myself and friends. There has been little more exciting in life than the finding of beautiful things and owning them for a time. As I live in the country about twenty miles from Paris, I confess to being, in my spare time, an enthusiastic, though constantly disappointed gardener. French soil is fertile and I have the best crop of weeds in Seine-et-Marne. Chiggers are the bane of my existence, keeping me out of the garden from the first of August until the end of October. You may be able to help me, should any distinguished members of the Class know any way of getting rid of the nasty beasts besides carving them out of the flesh with a knife. There must be a less painful and less disfiguring way. In October I always look as if I had been well peppered by a machine gun. Or had I better write to 'Information, Please'? I can guarantee the gratitude of the whole department of Seine-et-Marne to anyone who answers this — surely the injection of something with a hypodermic needle could solve it."

1905 Continued

Remember John C. Eadie, VI? The Secretary has written two letters to his old Isle of Man address without success. Now through another source, we learn that John is in Edinburgh, Scotland (10 North Park Terrace). If one of his old pals could dig him out of his hibernation, we might get a mighty interesting life history. George G. Wald, III, died at Chloride, Ariz., on November 21. Jacob B. Reinhardt, I, died at Rochester, N.Y., on November 11. These are abrupt announcements, but in spite of the fact that your Secretary has been trying to get further details, none has resulted.

By the time you read these notes you will have received from the reunion committee your first announcement of that affair. It will be an event in class history, and it requires the coöperation of all '05 men. If you haven't filled out and returned the questionnaire, do so at once. Whether you have or not, mark off now the dates of June 7, 8, and 9 for a very important engagement with about 75 or 100 of your old classmates. There's nothing more important happening next June. Andrew Fisher, committee on invitation of guests of national prominence, has received from President Compton an expression of enthusiastic desire to be present and a determination to do so, provided no emergency prevents. There being no greater emergency than an '05 thirty-fifth reunion, we invite you to reune with Prexy next June. — FRED W. GOLDTHWAIT, *Secretary*, 274 Franklin Street, Boston, Mass. SIDNEY T. STRICKLAND, *Assistant Secretary*, 75 State Street, Boston, Mass.

1907

Last November, I received from the M.I.T. Advisory Council on Athletics a letter similar to those sent to all Class Secretaries, setting forth the condition of the athletic funds and suggesting that a class contribution would be welcome. Harold Wonson and I felt sure that '07 men would want to have a share in this good work. Under date of November 28, the following acknowledgment was received from Ralph T. Jope '28, Secretary of the Advisory Council: "In behalf of the Advisory Council on Athletics, it is my privilege to extend to you and to Mr. Wonson — and through you both to the members of your Class — our deepest thanks for your contribution of $25 to the Advisory Council athletic fund for assisting in the conduct of M.I.T. athletics."

Clifford Allbright, architect, changed the location of his office in Boston to 177 State Street last November. For twenty years he has engaged in private practice. Although he seldom has attended class gatherings, I see him occasionally at his office. At the time of my last chat with him in December, he looked fine. He was married in 1916, but his wife died, under sad circumstances, in 1918, and he has never married again. He lives on Boston Post Road in the town of Weston, Mass.

Sam Coupal, of whom I wrote in the July, 1939, Review, now has his office in the Department of Mineral Resources, Capitol Building, Phoenix, Ariz. — As a new address for John F. Johnston, Jr., we have 935 Regal Road, Berkeley, Calif. I wrote to him on December 4 and hope to have further news about him for another issue of The Review. — Herbert A. Sullwold's home address is 823 South Bundy Drive, Los Angeles, Calif. Sully is an architect.

On Alumni Day last June, while talking with E. B. Ledesma '23, President of the Technology Club of the Philippines, I asked him if he knew Benjamin F. Mills of our Class. He said he did not know that an M.I.T. man by that name was in Manila, but that on his return to the Philippines he would try to find him. In December I received a letter from Ledesma, who is division manager of the Philippine Long Distance Telephone Company, Inc., saying that he finally had located Mills in the construction division of the United States High Commissioner's office in Manila.

Upon receiving notice from the Alumni Office that James Reed's address was in care of the Association of San Francisco Distributors, 333 Pine Street, San Francisco, Calif., I wrote to him. Reed, you will recall, is a Naval Academy graduate, class of 1902, and was a Course XIII-A man with us. The July, 1937, Review relates his activities up to that time, when he was general manager of the Golden Gate Bridge and Highway District. His reply to my December letter follows: ". . . After the completion of the Golden Gate Bridge, I remained only until the operating and maintenance personnel had been appointed and the bridge was opened up to traffic and operating smoothly. (I had agreed to remain until this was accomplished.) I had planned a good long vacation for Mrs. Reed and myself after the four and a half years of strenuous application to the bridge financing and construction problems, to say nothing of the governmental, political, and other administrative problems. Just at that moment, however, my good friend and classmate, Jerry Land '06 (Navy '02), now chairman of the Maritime Commission, insisted that I make a survey for the commission covering the West Coast shipyards and navy yards, to ascertain the availability of personnel and material for undertaking the commission's building program. In the meantime I was asked to do some consulting work for the Soule Steel Company, which I undertook as soon as the Maritime Commission survey was completed.

"In November, 1937, the principal wholesalers, distributors, and warehouse operators in the San Francisco Bay area organized this nonprofit association and asked me to become president. We have nearly two hundred firms for whom we handle all industrial relations, including the negotiation of contracts, interpretations, settlement of disputes between employees and employers, and so on. After a sixteen-week strike shutdown involving 134 firms, we finally won our point in October, 1938, when the C.I.O. agreed to sign the master contract. (We had already negotiated a master contract for those of our firms whose employees were represented by the A.F. of L.). . . . This movement of employers to associate themselves together for the purpose of dealing with employee organizations is spreading all over the country, and from most of the principal cities we get inquiries as to our form of organization, operating methods, and so forth. Our association . . . is a member of the Employers Council, which is a central clearinghouse for all employing groups in the city, representing, for example, the water-front employers, the steamship operators, the principal hotels, and so forth.

"With reference to personal affairs, there are no changes in my family setup. James, Jr., is still with Blyth and Company, 14 Wall Street, New York City. He was graduated from Stanford in 1932 and went immediately into the financial game. . . ."

Arthur Taylor Remick, who, though not a graduate, was associated with our Class for four years, died on September 30. He attended the University of Illinois before entering Technology, and was a member of Sigma Nu Fraternity. Since 1908 he had practiced architecture alone, having his office at 47 West 43d Street, New York City. He never married, and I have not been able to learn the name of his next of kin or the circumstances of his death. — BRYANT NICHOLS, *Secretary*, 126 Charles Street, Auburndale, Mass. HAROLD S. WONSON, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1909

The fall luncheon was held at the Technology Club in New York City on December 2, with Robert G. Caldwell, Dean of Humanities at M.I.T., as the guest speaker. His subject was "Some Adventures in Diplomacy," about which he was particularly qualified to speak, having been born in Colombia, taught in India, and been United States minister to Portugal and Bolivia. — On December 6, at the monthly luncheon of the American Institute of Consulting Engineers, Tom Desmond spoke on the public efficiency bill which, as senator, he has sponsored in the New York state senate. This bill authorizes all subdivisions of the state to engage consulting engineers and has been termed by the A.I.C.E. as the model consulting engineers bill.

From *The Tech* of December 12 we quote the following: "'A degree proves you have purchased a set of tools but it does not prove you are a good worker; that is up to you, yourself,' stated Mr. Bradley Dewey, '09, President of the Dewey-Almy Chemical Company, at a joint meeting of American Chemical Society and Chemical Engineering Society last night. Speaking on the subject 'After the Degree — What?', he pointed out the things that an employer looks for in a prospective employee. According to his viewpoint, of highest importance is mutual coöperation between the men. The average engineer is afraid to disclose his ideas for fear others will steal them,

1909 Continued

while actually it would be better for him if he shared the idea with everyone. Accuracy is important, but not as important as alertness and honesty of thought. Personal habits such as punctuality, neatness, friendliness, attentive listening, and ability to take and give criticism should be cultivated. The employee who is promoted is the one who makes the best use of his spare time by advancing his knowledge of the subject. In conclusion Mr. Dewey pointed out from his own experience, 'There isn't a big organization which isn't more worried about where to get men to promote than about what to do with the men they have.'"

Congratulations to Fred M. Green and Armin F. Herold on recent promotions to rank of colonel and lieutenant colonel, respectively. — John Nickerson is now general superintendent of production units at Cheney Brothers, South Manchester, Conn. — Dwight Sleeper, who has been living in Dallas, Texas, has moved back to Indianapolis where he is connected with the Insurance Audit and Inspection Company, with offices in the Hume-Mansur Building. — Mayo D. Hersey has become research director for Morgan Construction Company, Worcester, Mass., after fifteen years of service with the National Bureau of Standards, Washington. While in government service he organized the bureau's aeronautic instruments, and friction and lubrication sections. A member of the research committee, American Society of Mechanical Engineers, Hersey is author of *Theory of Lubrication*. He has been associate professor, properties of matter, at the Institute; physicist in charge of the physical laboratory, Pittsburgh experiment station, United States Bureau of Mines; and test department head, Kingsbury Machine Works, Inc., Philadelphia. — The Worcester *Telegram* of December 18, in an interview with Mrs. Hersey, said in part: "'My favorite musical instrument is the soft pedal,' says Mrs. Mayo D. Hersey, who signs her name Frances Warner Hersey, and who probably is best recognized by the reading public as Frances Lester Warner. It is difficult to associate such modesty with the successful author of a dozen books or more, yet those who have read Miss Warner's delightful essays and narratives, so sparkling and informal, cannot doubt the sincerity of her remark."

Doris Gilbert (Mrs. John Hitchcock) took the part of Juliet in the balcony scene from *Romeo and Juliet*, recently given as a part of a dramatic program by the department of drama of the New England Conservatory of Music in Boston. This program was given under the direction of Royce's brother, Clayton D. Gilbert. — The ballroom of Carl and Hazel Gram's home in Westwood was decorated with white chrysanthemums and Christmas greens for the musicale given on December 17 by their daughter Alberta, who returned to this country a few months ago after two years of voice study in Europe. Assisting at the tea which followed the program were many of Alberta's friends from around Boston. — CHARLES R. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass. *Assistant Secretaries:* PAUL M. WISWALL, MAURICE R. SCHARFF, New York; GEORGE E. WALLIS, Chicago.

1911

While reading President Compton's masterful annual report to the Corporation, in which he stated three major present duties of the Institute — carrying on the normal educational program with a minimum of confusion, expanding and improving the operations wherein staff and laboratories directly aid the country's welfare, and being alert to the needs of and opportunities for service to the nation in direct proportion to the degree of national emergency — I was particularly interested in the trend of student registration, and being statistically minded, I dug up figures as to the present distribution of '11 men and the source of supply when we were freshmen in 1908. I found a curious analogy between last year's student distribution and the present location of our classmates; witness: Approximately 67 per cent of students came from outside Massachusetts in 1938, while 67 per cent of our classmates are thus located; outside New England, approximately 60 per cent of students, 59 per cent Eleveners; outside the North Atlantic States, about 33 per cent of students, 35 per cent '11 men; and outside the United States, about 7 per cent of students, 5 per cent Eleveners. Back in 1908 we entered Tech 313 strong in a student-body total of 1,410, whereas this fall there are 605 freshmen in a student population of 3,100. By contrast, our student body, when we entered, came 45 per cent from outside Massachusetts; 36 per cent from outside New England; 24 per cent from outside the North Atlantic States, and 5 per cent from outside the United States.

At present our class mailing list embraces 397 names and the geographical spread shows 96 in Greater Boston, 35 in the balance of Massachusetts, and 31 in the rest of New England, or a total of 162 (41 per cent) in New England; 58 in metropolitan New York, 18 in the balance of New York State, and 48 in the other East Coast states, or a total of 124 (31 per cent) in the eastern states outside New England; 51 in the Middle West, 32 in the Southwest and West, and 7 in territories, or a total of 90 (23 per cent) in the U.S.A. outside the eastern states; 8 in Canada and 13 in other foreign lands, or a total of 21 (5 per cent) outside the United States.

Awakening quite regularly each morning just before seven, I am able to get the Esso news over WBZ at seven. To me the commercials used at the end of these five-minute newscasting events are tops. One early December morning I got a particular kick out of hearing the signature to a telegram announcing to all dealers that Esso laboratories had just been given the 1939 national award for chemical engineering achievement. The signature was that of Bob Haslam, X, general sales manager, Esso Marketeers, whose office is at 26 Broadway, New York. You're welcome, Bob!

It's interesting to hear from Roy VanAlstine, I, who, as a consulting civil and structural engineer, is principally engaged now in the development of Long Beach Harbor, Calif., that the work is being financed by profits from oil recently discovered under municipal harbor lands. Roy's office is at 410 East 9th Street, Long Beach, Calif. — We had hoped that Roy Seaton, II, dean of engineering at Kansas State College, Manhattan, Kansas, might travel east with his football squad for the game with Boston College in late November, but he didn't, worse luck! — Bill West, II, one of Tech's Honorary Secretaries in Chicago, has changed his firm name from W. C. West Company back to Great Lakes Forge Company, the title by which it was known when he acquired control. His office is 612 North Michigan Avenue, Chicago. — Norman DeForest, III, for years located at Sanford, Fla., is now at Maitland, Fla.

Here are a few new residential addresses recently received from the Alumni Office: J. Burleigh Cheney, II, 12 Seaview Avenue, Edgewood, Providence, R.I.; Professor Ibrahim F. Morrison, I, 11620 Edinboro Road, Edmonton, Alberta, Canada; Harold G. Soule, III, 38 Newbert Avenue, South Weymouth, Mass.

A year from now we'll be busy preparing for the big thirtieth anniversary. So "write to Dennie" with ideas therefor. — ORVILLE B. DENISON, *Secretary*, Chamber of Commerce, Worcester, Mass. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford, Mass.

1914

On December 19 the Boston '14 men gathered for luncheon at the Engineers Club to talk over the reunion of last June and to comment on various reunion events in their relation to the thirtieth. The general consensus seemed to be that the twenty-fifth fitted most satisfactorily into the general Alumni Day picture and the part played in it by the twenty-five year Class. It was felt, however, that the regular five-year reunions should again take the form that they had in the past, and that something along the lines of the twentieth, held at Oyster Harbors, should be the pattern for the future. Ross Dickson, who so ably chairmaned this year's reunion, is getting together various data for the next reunion committee. It would be appreciated if any comments regarding the conduct of future reunions could be submitted to Ross or any of the class officers. The last reunion ended with a modest deficit occasioned by the rather extensive advance publicity. Our Class President, Buck Dorrance, has generously underwritten this deficit. Your Secretary personally feels that now that we have had five five-year reunions, they should have sold themselves pretty well to the Class. Thus, extensive publicity should not be required for future reunions, and they should accordingly be self-supporting.

1914 Continued

Those attending this Boston luncheon were entertained by Dean Fales, who told about the trends in automobile designs. Dean insisted that this was a strictly off-the-record talk, and it certainly sounded so, much to the enlightenment of all present. Al Devine, who is assistant registrar of motor vehicles for Massachusetts, also presented some of his observations on the relation between structural difficulties and accidents. Those attending the luncheon were Clisham, Corney, Fales, Morrison, Crowell, Crocker, H. S. Wilkins, Sherman and guest, Devine, Gazarian, Dunn, Currier, Tallman, William Jackson — one of our honorary members — and your Secretary.

Russell A. Trufant had hoped to attend the luncheon but was unable to do so because of surveying work he is doing for the Metropolitan District Commission, which is arranging for an increased water supply to Boston. Trufant has been giving the line and grade for the actual laying of a 150-inch concrete pipe to take care of this new water supply. He says that he is using all the engineering he has ever learned to try to guess what will be the probable settlement of a 45-ton pipe filled with 44 tons of water and about 25 tons of backfill when passing from a ledge to quicksand.

It was a great pleasure to have had Joe Currier with us at the luncheon. He has recently retired from the Navy with the rank of commander and is now located in Boston. Joe joined the Navy almost immediately after graduation by entering the drafting department at the Boston yard. Shortly after that he became a commissioned officer, and has seen service on several of the Navy's larger ships, at one time being chief engineer of the U.S.S. *Salt Lake City*. His shore duty has included posts at Philadelphia, Boston, and Cavite, Philippines, the latter being his final station where he was the planning officer of the yard. — Another naval commander is R. D. MacCart, who is now stationed at the Naval Aircraft Factory in Philadelphia. MacCart was promoted to the grade of commander about a year and a half ago.

While in New York recently your Secretary met Walt Keith of Akron, who was in New York for the annual dental show. Walt, who was displaying his dental rubber, reported business good. — Ray Dinsmore, also in the rubber business, has recently received a splendid promotion by the Goodyear Tire and Rubber Company: He has been made manager of the development and research departments of that company. — Another '14 man to receive a recent promotion is A. J. Hoyt of the American Steel and Wire Company, a subsidiary of the United States Steel Corporation. Recently located in Worcester, Mass., as assistant manager of operations for that district, he has been moved to Cleveland and appointed manager of the Cleveland district. Congratulations to Dinny and Al.

A recent letter from Rucker Bristow was on a new letterhead, which fact caused us to inquire whether or not he had a new position. The answer came back that it was all the same family. For a number of years Rucker has been engaged in obtaining oils and concentrates from citrus fruit and has been located at Dunedin, Fla. As the organization is primarily one of development and research, Rucker has had the job of getting some of the new processes started, and this fact accounts for the different names of these new manufacturing organizations. Any '14 men affluent enough to spend their winters in Florida will find a cordial welcome awaiting them if they will look up Bristow at the Citrus Concentrates, Inc., at Dunedin, of which company he is secretary. — H. B. RICHMOND, *Secretary*, General Radio Company, 30 State Street, Cambridge, Mass. CHARLES P. FISKE, *Assistant Secretary*, 1775 Broadway, New York. N.Y.

1915

Only 128 days to our twenty-fifth reunion in June. The committees are all loyal and willing, but it takes the active support of every classmate to make this a big and successful reunion. — The last three letters I had are good ones, and it is a pleasure to give them to you. First, from Andy Anderson: "Just got your letter, which I'll answer right away. I also had a letter from you months ago, which I'll answer first. In that letter you said that you would like to visit our job; I guess that could be easily arranged. We have no more 'air' in New York now, but I figure that it will be on in Queens till around September. To visit the 'air' end, you would only have to see our doctor and let him O.K. you. . . . Anyhow, I am around from eight in the morning till four, five, or maybe six at night. So if you land in town, call up the Walsh Construction Company and ask for Anderson; if you land at the Grand Central Station, walk east on 42d Street to the East River and you'll be right there — it's only Lexington, 3d, 2d, and 1st avenues over to the job. If you make it, you will find me around somewhere or in the 'hole,' not dressed as an engineer but dirty and getting dirtier by the hour. Even if I'm busy, I'll take care of you and show you around. . . .

"I'm going to do my best to be there in 1940. I see that guy, Rooney, is on the committee with you for that twenty-fifth party, tough *hombre*. Remember me to George and the rest of the gang. . . . That reminds me — and it had me going for awhile: One of the night boys, who is from Tech, evidently met MacBride. In the conversation they got around to me and George, Scully, Lucius Aurelius Bigelow, and so on. Anyway, one morning I found a note from George Rooney on the desk, and I really thought the bum had been around. Next morning there was a note signed by Lucius Aurelius Bigelow, of all men, and I wondered what kind of a W.C.T.U. convention was in town. Anyway, I got quizzy, and the lad told me the whole story: Rooney, Scully, Bigelow, and so on, were out for a drive and got overcharged, tight, and wrecked. When he told that one — that Lucius had been drinking — I knew it was a hoax, and he confessed to the meeting with MacBride and the cooking up of such a yarn. . . ." — I presume Andy's invitation to me to go down into the vehicular tunnel which he is building from Jersey City to Long Island City holds for any of our classmates visiting in New York.

We ought to have more Raymond Stringfields in the Class. Just read the two fine letters which follow, the first from Los Angeles and the second from Pocatello, Idaho: ". . . Latest news from the western front is that my wife and I rode out to the Norconian Club, one evening, with Ken Kahn and his wife in their new Packard, which compares favorably with my old Plymouth. Wife decided Ken used good judgment in turning from chemical engineering to contracting, and I can keep in all kinds of stews with my consulting work in rubber and plastics. Am afraid I'm degenerating into a hot-air artist instead of an engineer. Have talked on modern plastics in industry to local sections of the American Society of Civil Engineers and the American Society for Testing Materials in the last few weeks, and am slated to talk to the employees' institute at Douglas Aircraft and to the Aeronautical Engineers.

"Last spring I had a little swing up to San Francisco which enabled me to get a look at the Exposition and also to spend a night in Yosemite. I've been in the latter lots of times but never before in the spring of the year, when it is by all odds the most beautiful. The wild flowers were gorgeous, and the waterfalls were still running high, wide, and handsome. You know, in this country of little rainfall, the latter nearly dry up by the end of summer. — Bill Mellema has been having more than his share of tough luck, with a sick wife and boy, but I understand both are getting along. El Norberg is rapidly completing his big job of rebuilding the Los Angeles schools that were damaged by the earthquake some years ago, and has put in some beautiful buildings. We got him in bad with his wife last time we mentioned him, so musn't say anything about the six nights a week he puts in on lodge work. He gets me to go about once in three months. . . ."

"This letter finds me giving a bunch of lectures on modern chemistry to most of the high schools in these northwestern states. Have pretty well covered Utah and southern Idaho, and will soon be swinging up into northern Idaho and then Washington and Oregon, before coming down into California again to give them some of the same dose. Darwin was wrong. We've been brought up to believe that biological development was always an improvement, but here you see a perfectly good chemical engineer degenerating into a hot-air merchant. It's pretty interesting, however, and I am certainly getting acquainted with this territory, which is a beautiful country even though this last week it has rained so much that I could stand a little dry weather for a change.

1915 Continued

"I can't remember whether or not I answered your letter about helping round up the Class. It was on my desk in the rush just before I left. I will of course be glad to do anything I can, and it occurs to me that if you could send me the names of any of the boys who are in Washington or Oregon, I may have a chance to look them up in the next few weeks and at least give you a report as to their activities. Will be back in California about December 6 pestering the schools there till the middle of March when I go back to the University of Southern California and to several consulting jobs that are waiting for me. . . . I had nice visions of getting back to Boston in June, but I have one daughter graduating from junior high and another one from senior high the last of June, and the wife says we can't get away till then. . . ."

Christmas cards from a number of classmates warmed my heart with the feeling of our fine friendships which have extended over these many years. To all of you who remembered me, my thanks. — Now you chaps must think I cry "wolf, wolf" about a scarcity of class notes, but, frankly, this time the wolf is practically at the class notes' door. If you don't send in something for future notes, it may be too late to "Help Azel!" — AZEL W. MACK, *Secretary*, 40 St. Paul Street, Brookline, Mass.

1916

B. C. Boulton, I, who recently has been vice-president and chief engineer of the Glenn L. Martin Company of Baltimore, Md., was, during December, appointed assistant chief project engineer for the Lockheed Aircraft Corporation at Burbank, Calif. Classmates may remember that Boulton joined the United States Air Corps after graduation and spent six or seven years at McCook Field. — Maynard C. Guss, I, who handles engineering and purchasing for the Standard Oil Company in Shanghai, China, has been with that organization from July, 1916, to the present, and hopes to retire in July, 1946. He has a daughter in the Boston Children's Hospital Nursing School. — The latest news of Gilbert H. Gaus is that he is a sales engineer with the Gardner-Denver Company of Quincy, Ill., manufacturers of pumps and air compressors. He is located at their headquarters at 76 9th Avenue, New York City. He has two boys and is sending the older to Lehigh University. His present home address is 102 Rynda Road, South Orange, N.J.

Classmates wishing to bring themselves up to date on the intricacies of refinery gases would do well to read the address Bob Wilson gave at the Chemists' Club in New York City on November 10, when he was awarded the Chemical Industry Medal for 1939. This address is reviewed and a great deal of it printed verbatim in the November 20 issue of the American Chemical Association's publication, *Industrial and Engineering Chemistry*.

When in Chicago recently, I talked with Ralph Bagby, II, Frank Bucknam, I, and Joe Connolly, XI. Bagby is busy producing machinery for filling ice-cream packages (as he says, to pass Joe Connolly's inspections in the city of Chicago). All of his machines are specially made from his own designs. I understand that the Kraft Phenix Cheese Corporation uses some 25 or 30 of his products. Frank Bucknam covers Michigan and Indiana for a group of mutual fire insurance companies. He has a daughter who is a freshman at Purdue University where she is taking the course in home economics. Frank also has a 14-year-old boy who probably will be thinking of M.I.T. in a few years. Joe Connolly was recently honored by being elected chairman of the Conference of Municipal Public Health Engineers. (Those who remember him as a very slight and slender youth at M.I.T. will be interested to know that he, too, has succumbed to the "fair, fat, and forty" tendencies, tipping the scales at 160 pounds now.

Our versatile Walt Binger, Manhattan commissioner of borough works, broke into print again in December. The New York *Herald Tribune* one morning carried a full-column story of how Walt, in court before Judge Curran, offered to pay the bill of a citizen who, taking a rest cure from the noise created by Walt's East River Highway construction work, had incurred $65.32 expenses for himself and his wife. To quote from the newspaper: ". . . At this point Commissioner Binger offered to pay the bill and the magistrate handed it to him with startling alacrity." Perhaps we can get Walt to underwrite our twenty-fifth reunion since he is so generous in looking after the hotel bills of others. — JAMES A. BURBANK, *Secretary*, The Travelers Insurance Company, Hartford, Conn. STEVEN R. BERKE, *Associate Secretary*, Coleman Brothers Corporation, 245 State Street, Boston, Mass.

1918

Our old friend and classmate, Sam Chamberlain, came to the fore again this fall. Two clippings are before me, one telling of the showing of his works at the Marblehead Arts Association in the King Hooper Mansion in Marblehead, and the other reporting on his new book, *Nantucket: a Camera Impression*, which was put out by Hastings House in September. To quote from the Boston *Evening Transcript* of September 23: "The appearance of another book by Samuel Chamberlain is always a cause for rejoicing by lovers of the New England scene. 'Nantucket,' his latest, is a fit companion to those others which have preceded it. Issued under the collective title of 'American Landmarks,' so far, at least, they have dealt with Massachusetts. He has covered Salem, Marblehead, Cambridge, Boston, Lexington, Concord, and the Wayside Inn. It is to be hoped that his teaching duties at M.I.T. will keep him here for many years to come. There is still much material for his capable lens.

"For Mr. Chamberlain, an architect, people have little appeal. To him they are transients. Nantucket's painters, tourists, summer colonists and antique dealers are a far cry from the sturdy whaling men of the '40's who gave the island its unique character. But they live in the same houses. This, then, is a story of houses. Through them, as through nothing else, can we get the true picture of the salty, weatherbeaten charm of New England's most famous island. Mr. Chamberlain has had a varied and interesting career since his days as an undergraduate at M.I.T. There as a student of architecture, he used his artistic ability to advantage by establishing a chain system of window signs for department stores. On graduation, with the lure of travel in his blood, he dropped his sign brushes in favor of the piano, playing his way across two oceans. In the years that followed he rapidly established himself in the front ranks of the country's etchers and lithographers. Prints by 'SVC' are prized possessions in many American homes today. In the early '30's, however, like his fellow etcher, Levon West, he discovered that the etching business was not all it should be in a falling market, and turned to photography. Levon West bought a miniature and changed his name to Ivan Dmitri, for photographic purposes. Sam Chamberlain got a view camera and kept his name, unafraid of lowered prestige. Today prints by Chamberlain rank high in the photographic field as do his etchings in theirs. His training as an architect gives assurance that his subjects are worth recording."

In the Boston *Herald* on November 12 appeared the following: "The public are invited to view the recent (the newspaper had 'decent') works of Samuel Chamberlain, internationally known etcher, at the Marblehead Arts Association in the King Hooper Mansion. Several pencil sketches are shown for the first time. Important are the recently completed series of etchings of Yale University. Eight views of famed restorations at Williamsburg augment the prints showing this famous graphic artist's keen awareness of early American architecture. Chamberlain returned to America from France three years ago to live in Marblehead. That together with Cape Ann and Cape Cod was the inspiration for his photographic books on New England. All these are representatively shown in his exhibition. His latest print 'Summer Shadows' is a view of the elm lined street in Marblehead on which the King Hooper house stands. Chamberlain's 'Chestnut Street, Salem,' an already exhausted edition, was voted the most popular etching when it was placed on view at the World's Fair. Chamberlain studied architecture at M.I.T., drove an ambulance in France during the last war, won a Guggenheim scholarship at the Royal College of Art, London. His prints are in the permanent collection of the British Museum, Victoria and Albert Museum, Bibliothèque Nationale, Metropolitan Museum, Library of Congress and many other noted collections."

The following arrived recently from our worthy President. Apparently it was a carbon of something he had written for somewhere else, but I am going to

1918 Continued

copy it here. The screed is entitled "Gee Up Thare." Here goes: "The President of the Carnegie Institution of Washington [Vannevar Bush '16], for whom I have a deep and abiding affection, owns a farm only a few miles from our five acres on the east shore of Thorndike Pond. He also owns a yoke of Holstein oxen. . . . After watching the two boys and me, armed only with such toilsome tools as ax and saw, making a pathetic frontal attack on the legion of stumps which the hurricane had left, he said: 'Why don't you borrow my oxen? You can have them most any time, but you'll have to drive them yourself — drive them through the village yourself.'

"There was a glint of the untamed imp in his eye. The villagers would have a real treat seeing me try to negotiate traffic with a breed that has always insisted on viewing life at just the right speed. Fitted out with the standard equipment of overalls, straw hat, and goad, I punctuated the morning with a brisk command, gave the off ox a vicious poke, and started up the road with a momentary glow of self-sufficiency. But I couldn't remember whether 'Gee' or 'Haw' was 'Turn left.' It was thirty years since I had been a boy on a farm.

"Sooner or later it was inevitable that an automobile would come smashing out of the distance. Fortunately at the right moment there was a lazy crescendo of motion from the oxen who sighted an open barway on the right, leading invitingly to a field of half-grown corn. The goad swung implausibly through the air in a moment of wild, comic contortion. Somehow we got back onto the road without too much damage to the corn. By the time we reached the village, two miles away, control had become more quietly authoritative. Financial giants rode elegantly by in their Plymouths and Fords, but the road was ours by right and theirs only by sufferance, and we knew it.

"A stranger, obviously a summer resident, anxious to shake off the dull, prosy stuff of the war-ridden present, dashed out to ask if he might photograph the oxen with his house as a background. I obliged with a piece of timothy grass between my teeth while the oxen assumed an air of bored but profound accomplishment. 'Thanks so much for the picture. That's an unusual sight these days!' he said. The off ox swished a fly from his rump and shifted his eyes as though to say, 'The yoke's on you, mister. This is only a college professor driving.'

"Those oxen and I soon came to understand each other, even when the nigh ox would deliberately step across the chain so he couldn't be expected to pull. That trick had been put over on me more than a quarter of a century before. Amazing that so specialized a piece of deliberate cussedness could be handed on from generation to generation. A horse tangled in a chain is a nervous, dangerous creature, but not an ox. In the woods one would be rash indeed to turn a team of horses over to an inexperienced boy, but it is pretty safe with oxen; Theodore, hot to discover at firsthand the mysteries of handling them, took the goad and cried, 'Mush.' They started." — That is the end of the tale of the Magouns. Maggie also writes that he and the boys built a six-room house from the hurricane lumber on their place this summer, and if any of the Class would like to rent it, just get in touch with him and see what kind of a bargain you can make.

Now for changes of mailing address: Frank H. Appleton, 280 Highland Avenue, West Newton, Mass.; Carlton S. Ayer, 1152 Pleasant Street, Worcester, Mass.; Stuart M. Boyd, 26 North Hoadley Street, Naugatuck, Conn.; John H. Chase, 4734 Somerset Drive, Riverside, Calif.; Claude T. Crapo, 84 Quinlan Avenue, Port Richmond, N.Y.; Edgar N. Goldstine, 232 30th Avenue, San Francisco, Calif.; Robert C. Heyl, 1011 Prospect Avenue, Pelham Manor, N.Y.; Chester E. Linscott, 427 Linwood Avenue, Ridgewood, N.J.; James E. Longley, 14 Beechwood Road, Verona, N.J.; Joseph Low, 6630 16th Street, N.W., Washington, D.C.; Donald W. MacArdle, 25 Bay View Avenue, New Rochelle, N.Y.; Wendell P. Monroe, 8034 South Kenwood Avenue, Chicago, Ill.; George R. Pierce, 3124 21st Street, Lubbock, Texas; John R. Poteat, General Electric Company, 1285 Boston Avenue, Bridgeport, Conn.; Harold M. Richardson, 9 Putnam Avenue, Lowell, Mass.; R. Robinson Rowe, Department of Public Works, 330 Public Works Building, Sacramento, Calif.; Henry C. Stephens, 1025 East Chapman Avenue, Orange, Calif.; Earle R. Stewart, 5060 Montecito Avenue, Santa Rosa, Calif.; Frank A. Travers, South Basin Oil Company, 3508 Atlantic Avenue, Long Beach, Calif. — GRETCHEN A. PALMER, *Secretary*, The Thomas School, The Wilson Road, Rowayton, Conn.

1919

The Secretary has had a 10 per cent response to correspondence sent out during the last part of the past year and wishes to thank those who have replied to the request for news. — Bill Banks wrote in to offer congratulations on The Review notes about the reunion and has sent the first request for snapshots of the class reunion taken with the Secretary's Zeiss 4.5 at Belmont, Mass., last summer. — Ark Richards dropped in to the Secretary's New York office during December to pay his respects. He is doing very well with his new line of business, and we all wish him the best of luck in the new year. — Wayland S. Bailey, who wrote us in November, is a professor in the mechanical engineering department of Northeastern University. He lives in Norwell, Mass., is married, and has two children — a girl of eleven and a boy of seven. Bailey spent some years in the South but was glad to get back to New England.

We were interested to learn that Marshall C. Balfour, who is a medical doctor, has moved from Athens, Greece, to Shanghai, China, where his address is 22 Route Delaunay. — Louis J. Brown is with the New York Telephone Company, Room 1381, 140 West Street, New York, N.Y. — Herman A. Herzog has moved from Lawrence, Mass., to 505 South Maple Avenue, Glen Rock, N.J. — Reginald S. Hunt has moved from Newtonville to Auburndale, Mass., where his address is 10 Bonmar Circle. — Victor N. Samoyloff has moved from Bridgeton, N.J., to 629 West 135th Street, New York, N.Y. — Howard L. Whitcomb has moved from Temple, N.H., to Peterborough, N.H.

Roderic L. Bent of Gardner, Mass., is married and has two boys — one sixteen and one fourteen. I presume that the enrollment at M.I.T. will soon include one or both of the Bent boys. Rod is president and treasurer of S. Bent and Brothers, Inc., manufacturers of chairs and Colonial reproductions. — An interesting letter was received from Elisabeth Coit, who is practicing architecture — houses, estates, restaurants, and so on. She is doing housing research on an American Institute of Architects' fellowship and is also serving on housing committees in New York City. Water colors seem to be one of her hobbies, and she has had exhibits in New York and Cambridge. She does a good deal of flying and has been doing some water colors from the air. She states that this requires a new technique of seeing. The New York group hope that Elisabeth Coit will be in town for our next gathering, so that we may learn more about her interesting occupations and travels.

The following classmates have changed their addresses: John S. Carter, II, 50 Lincoln Avenue, Norwich, Conn.; Laurence W. Cartland, XV, 11 Middle Avenue, Millville, N.J.; Louis J. Grayson, XV, 401 Rosemary Street, Chevy Chase, Md.; George A. Irwin, VI, 90 Elm Street, Andover, Mass.; Alfred A. Johns, XI, 465 Hurstbourne Road, Rochester, N.Y.; George C. McCarten, X, 576 Church Street, Bound Brook, N.J.; John H. Nelson, VI, Public Seating Industry Trade Association, 700 Southern Building, Washington, D.C.; and Arnold B. Staubach, IV, 3406 Windsor Road, Austin, Texas.

Louis A. Brown, Jr., a practicing architect, received mention in the New York *Herald Tribune* last year for his work in the amusement area in the New York World's Fair: "Louis Brown, Jr., designer of the Dutch 'Heineken's on the Zuider Zee' has copied authentic buildings." The focal point of the village was a restaurant seating 1,000 persons where Netherlandian dishes and drinks were served. Brown recently completed a group of buildings for St. Anne's School in Charlottesville, Va. The following write-up describes these buildings: "St. Anne's school for girls of the Episcopal Diocese of Virginia, sister school to St. Catherine's at Richmond and St. Margaret's at Tappahannock, will remove to its new home at Greenway Rise, one mile west of Charlottesville, early in 1940. . . . Construction is nearing completion on a new $100,000 class room building, which will include a fully equipped gymnasium and chapel wing.

1919 Continued

The present residence building has been converted into a dormitory and reception hall; and a completely new dormitory unit has been erected for immediate occupancy. The group of buildings, planned and executed by Louis A. Brown, Jr., architect, of Charlottesville, are of fireproof face brick construction trimmed with ornamental stone. They are planned to permit separate quarters and study rooms for the lower, intermediate and upper schools, and separate entrances for the lower grades. The completed plant will accommodate 200 day and boarding scholars. . . ."

Your Secretary saw Cliff Carlton'17 in Chicago for a few moments late in November at the American Petroleum Institute meetings at the Hotel Stevens. — E. R. Smith of the Bureau of Standards sent us Christmas greetings. — We have just learned that William H. Bassett, Jr., lives in Scarsdale, N.Y., and works at the Anaconda plant in Hastings-on-Hudson, N.Y., where your Secretary resides. — Several months ago your Secretary ran into George L. Baum, who now works for Johns-Manville in New York City. — EUGENE R. SMOLEY, *Secretary*, 2 Fairmount Avenue, Hastings-on-Hudson, N.Y. GEORGE W. MCCREERY, *Assistant Secretary*, 275 Cypress Street, Newton Centre, Mass.

1921

D. C. Jackson, Jr., VI-A, has achieved new honors in his recent selection as dean of the college of engineering of the University of Notre Dame, Notre Dame, Ind. Dug's popularity is such that we have been swamped with notices of his new association, and acknowledgments are due Professor Locke'96, Saint, The Review, *VI-A News*, *Electrical World*, and *Electrical Engineering*. Dug received an arts degree at Harvard in 1917 and served in the United States Army as an officer in the Coast Artillery from 1917 to 1919. He resumed his studies at Technology and was graduated with both bachelor's and master's degrees. Until 1923 he was an instructor in electrical engineering at the University of Missouri and for the next two years assistant professor of electrical engineering in charge of electrical engineering instruction at Trinity College, now Duke University. From 1925 to 1930 he was professor and head of the department of mechanical and electrical engineering at the University of Louisville, and from 1930 until the start of the second semester in 1936 Dug held a similar position at the University of Kansas. He became director of Lewis Institute, Chicago, at the beginning of the academic year in 1935 and continued until 1938. Since then he has been collaborating with his father, D. C. Jackson, Professor Emeritus of Electrical Engineering at M.I.T., on a survey of engineering education for the Engineers' Council for Professional Development. Dug is a fellow of the American Institute of Electrical Engineers and a member of the American Society of Civil Engineers, American Society of Mechanical Engineers, and the Society for the Promotion of Engineering Education. The Jacksons' new home address is 521 West Colfax Avenue, South Bend, Ind. Congratulations and best wishes from all of us.

Our neighbor across the street, Jesse Maury'25, reports that he frequently sees the globe-girdling Hugh E. McKinstry, XII, in New York where the latter can be reached at Room 1700, 84 William Street, between expeditions to distant lands. We have asked Jesse to use his persuasive powers to get Hugh's story for these columns, an assignment in which our own previous efforts have been notably unsuccessful. — John W. Rockefeller, Jr., IX-B, now makes his home at 16 Park Circle, Short Hills, N.J., where he is a near neighbor of Ev Vilett'22, to whom we are indebted for the news. John's business address is 72 Washington Street, New York City. — Ambrose L. Kerrigan, VI, is a member of the electrical engineering staff of the Fitchburg Gas and Electric Light Company, Fitchburg, Mass.

Ernest R. Gordon, XII, is another of our much-traveled geologists who crashes the headlines every so often in accounts of new laurels he has won. Congratulations are now in order as the result of the following article which appeared recently in the *Mining Journal:* "Ernest Rollin Gordon, who has been in San Bernardino, Calif., directing exploration work in the U. S. for the Amparo Mining Company, has been transferred to Etzatlan, Jalisco, Mexico, as assistant general manager of the company and its subsidiaries in Mexico. Gordon is a native of Boston and was graduated from M.I.T. with a B.S. degree in 1921. He received his M.S. degree at the University of Arizona in 1922. In 1923 he joined the staff of the Cananea Consolidated Copper Company at Cananea, Sonora, Mexico, as assistant geologist. In 1924 he became an engineer for Cia. Minera de Penoles at Ojuela, Durango. Gordon joined the American Smelting and Refining Co. in 1925 as engineer and later was named mine foreman of the Santa Eulalia branch. In 1929 he became chief engineer of the San Pedro unit of A. S. & R. He went to the Amparo Mining Co. in 1930 as mine superintendent at Piedra Bola, Jalisco, and the following year he was made general superintendent of operations at Guanajuato. He held that post until 1936 when he was made local manager for the Amparo company at Durango, Colorado, and then was placed in charge of all exploration work in the United States."

Dennie Denison'11 is the recipient of our sincere thanks for the following welcome note received via Saint: "I know you'll be interested to learn that George T. Welch, XV, has just been named comptroller of Vassar College, Poughkeepsie, N.Y. Word came to me from my daughter, Helen Elizabeth, now a freshman at Vassar. When Mrs. Denison and I took our young lady up to the college to register, we naturally first visited the office of the comptroller (bursar to you) to pay the bill, and there loomed a familiar face. 'Hellos' ensued and an old friendship was renewed. I had forgotten that George, formerly assistant registrar at the Institute, had been assistant comptroller at Vassar for five years. We later met a number of members of the staff and I heard many fine things about the thoroughness of George's work. He and his wife are great favorites on the campus."

Howard F. MacMillin, II, President of the Hydraulic Press Manufacturing Company of Mount Gilead, Ohio, was in New York at the opening of his company's booth at the Chemical Industries Exposition, but we failed to connect with him at the show or at his company's local offices. Let us know in advance the next time you spend some time here, Howard. A message via the Bemis Bag organization at the show brought a much appreciated response from Homer Howes'20 who, according to his letter, has the new title of master of fox hounds of St. Louis. — Your Assistant Secretary spent a day at the Institute recently while in Cambridge to deliver a paper on I. T. and T. selenium rectifiers to the Boston section of the Institute of Radio Engineers, meeting at Cruft Laboratory, Harvard.

Here are some of the many new addresses of the last month: George H. Atkinson, X, 1153 Herman Avenue, Akron, Ohio; Dr. O. Kenneth Bates, II, 17 Goodrich Street, Canton, N.Y.; George A. Beéche, III, Cia Salitrera Esperanza, Calle Agustinas 972, Oficina 538, Santiago, Chile, S.A.; Edward W. Booth, IX-B, 51 Pine Ridge Road, Waban, Mass.; Dr. John Campbell, XIV, 17 Ashley Place, Glens Falls, N.Y.; Roger Clapp, I, House of David, Post Office Box 175, Benton Harbor, Mich.; Ormond W. Clark, XIV, 424 Abbott Avenue, Ridgefield, N.J.; Robert S. Cook, I, 50 Gibson Street, Canandaigua, N.Y.; Robert B. P. Crawford, XIV, 560 Hill Street, Athens, Ga.; Alfred H. Fletcher, XI, Bureau of Sanitary Engineering, 105 Court House, Memphis, Tenn.; Carl W. Hammond, II, Dalton Road, Chelmsford, Mass.; Philip H. Hatch, VI, 514 Siwanoy Place, Pelham Manor, N.Y.; Edward W. Haywood, X, 37 Ravine Road, Melrose, Mass.; Robert J. Hole, XV, 2920 Coleridge Road, Cleveland, Ohio; Henry A. Hutchins, XIII-A, National Union Radio Corporation, 57 State Street, Newark, N.J.; Herbert A. Kaufmann, X, 5460 Hyde Park Boulevard, Chicago, Ill.; George R. Knight, XV, 161 Moraine Street, Brockton, Mass.; Fred E. Kowarsky, X, 175 Smull Avenue, West Caldwell, N.J.

Other changes of residence have been received for the following classmates: Major George F. Lull, VII, U.S. Army, Carlisle Barracks, Carlisle, Pa.; Robert F. Miller, XV, 10 Monroe Heights, Cortland, N.Y.; Lieutenant Colonel Raymond G. Moses, I, U.S. Engineer Office, Vicksburg, Miss.; Myer H. Naigles, XV, Apartment 102, 2311 15th Street, N.W., Washington, D.C.; Alan Osbourne, XIII, 2817 Connecticut Avenue, Washington, D.C.; Max B. Pearlstein, I, 176 Harvard Street, Boston, Mass.; Donald W. Randolph, II, 2921 Westwood Parkway.

1921 Continued

Flint, Mich.; John M. Sherman, X, 18 Edward Street, Belmont, Mass.; Captain Don G. Shingler, I, care of Adjutant General, United States Army, Washington, D.C.; George E. Shoemaker, Jr., VI, Ithan, Pa.; Everett A. Soars, XV, R.D.1, Beaver Falls, Pa.; Herbert V. Thaden, II, 280 Parker Drive, Mount Lebanon, Pittsburgh, Pa.; Simeon E. Travis, Jr., VI, United States Civil Aeronautics Authority, 927 Canal Bank Building, New Orleans, La.; Arthur A. Turner, I, 153 Lake Avenue, Metuchen, N.J.; Eugene S. Weil, X, G. S. Robins and Company, 126 Chouteau Avenue, St. Louis, Mo.; Everett J. Wilson, II, Kay Boulevard, Newport, R.I.; Rev. Williston Wirt, XV, 275 West 19th Avenue, Eugene, Ore.

Your Secretaries want to take this opportunity to thank the senders of holiday greetings for their good wishes and the considerable aid toward this column. — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, Manchester, Conn. CAROLE A. CLARKE, *Assistant Secretary*, International Telephone Development Company, Inc., 137 Varick Street, New York, N.Y.

1922

If there remains any question about which is the liveliest Class ever to have been graduated from the Institute, the matter can be quickly settled by consulting the Technology Club of New York. Ask Al Glassett'20, President of the Club, who was an honored guest at the regional '22 class dinner, held at the Technology Club in New York on December 7. Over fifty members of 1922 attended. Spirits were high, and the fellowship and food were excellent. A loudspeaker hookup had been arranged whereby Heinie Horn, unable to get to New York for the occasion, delivered his greetings to the gang by telephone from Akron, Ohio, pointing out that it is time to start making plans for the next reunion, now only a couple of years away.

We think it both unusual and flattering for a local class dinner to be able to boast the attendance of President Compton. Nevertheless, he was present, and we hope he found the affair so enjoyable that he will agree to play a return engagement. He told us, with his usual clarity, about affairs at the Institute and gave us an intimate picture of what goes on behind the scenes. All in all it was a dinner that will long be remembered and presages more of them in the future. Full credit for the success goes to Bill Mueser, who arranged everything with his usual efficiency.

As before, several men from parts of the country more or less remote from New York City were able to attend: Herb Ham came from Springfield, Mass.; Tom Gill, from Trenton, N.J.; and Hugh Shirey, from Rochester, N.Y. A mimeographed list of those who attended is available from the Secretary. Jack Liecty, formerly of Dallas, Texas, gave us the comforting news that he has returned to New York permanently. He is still with Electric Bond and Share Company.

A very clever Christmas greeting from Dave Abrahams announces that in May of last year he married Evelyn Leavitt of Swampscott, Mass. Dave is a well-known architect in Boston and has received particular prominence in the field of residential architecture. Not long ago one of his houses was awarded the first grand prize in the national competition sponsored by the *Better Homes and Gardens* magazine.

With deep regret we announce the death of Will Amon in New York on December 10. The Class has lost one of its staunch supporters and the architectural profession has lost one of its outstanding leaders. Amon attended the New York dinner on December 7, but stated that he had not yet fully regained his strength following a recent operation. We extend the condolences of the Class to Mrs. Amon and the two children.— CLAYTON D. GROVER, *Secretary*, Whitehead Metal Products Company, Inc., 303 West 10th Street, New York, N.Y. C. YARDLEY CHITTICK, *Assistant Secretary*, 77 Franklin Street, Boston, Mass.

1923

Clark Kittrell, whom I asked about a change of address recently, says I must have meant a change of duties. He says he has been a major with the United States Engineer Office at Fort Peck Dam, Mont., since 1934. Until 1937 he was construction engineer; since then he has been in charge as district engineer. Fort Peck Dam is a hydraulic fill containing 122,000,000 yards, more than four times as large as the world's next largest. — I have the following from T. E. Huffman: "My change of address from Lufkin, Texas, to 2130 Broadway, Beaumont, Texas, was occasioned by my transfer to Beaumont as district engineer for the Texas State Highway Department. As district engineer at Beaumont, I am in charge of construction and maintenance of highways in eight counties in this section of Texas. At the present time, we are carrying on a large construction program, consisting of highway paving and a number of large bridge projects."

From the Brooklyn *Eagle*, September 19: "Henry Belin du Pont, who has been assistant to the president of E. I. du Pont de Nemours, and a member of the board of directors, has been elected vice-president and a member of the executive committee. Mr. du Pont is 41 years old and a graduate of Yale University and of Massachusetts Institute of Technology. After four years' service with General Motors as research engineer, he became associated with the du Pont company in 1928. Following a few years in the treasurer's department, he turned to engineering work, first with the ammonia department and then for seven years with the engineering department. He was in charge of its technical division for nearly four years. In July, 1938, he became assistant to Lammot du Pont ['01], President." — HORATIO L. BOND, *Secretary*, 457 Washington Street, Braintree, Mass. JOHN M. KECK, *Assistant Secretary*, 441 Mount Prospect Avenue, Newark, N.J.

1925

Recently I learned that James S. McDonnell, Jr., had left the employ of the Glenn L. Martin Company to start an aircraft company of his own. I wrote to him and received the following letter in reply: ". . . I have my nose to the grindstone now, whether I like it or not. I enclose a recent clipping which will tell you something about the McDonnell Aircraft Corporation."

Here are a few excerpts from the article, which appeared in the St. Louis *Commerce* for September 27: "The McDonnell Aircraft Corporation, a company newly organized to engage in the design and manufacture of military airplanes for the United States government, began operations Monday in its temporary headquarters at Lambert-St. Louis Municipal Airport. . . . The president of the new company is J. S. McDonnell, who . . . is a graduate of Princeton University and of the Massachusetts Institute of Technology. In the latter school he studied aeronautical engineering and then went into flyers' training in the Army Air Corps (1923–24). Since that date he has served as test pilot, aeronautical engineer, designer and executive in the aircraft industry. . . . The McDonnell Company will be St. Louis' fifth aircraft manufacturing company. . . ." — Good luck in your new venture, Mac.

Cuthbert Daniel, X, whose most recent address on our records has been Scranton, Pa., is now with the Princeton Radio Research Project at 22 East 17th Street, New York City. — John C. Dunbar, XV, is now at Miami Beach, Fla., his address there being 1063 West 47th Street. He formerly lived in Arlington, Mass. — George Elkins, IX-B, has been living in Scotland for some time. To the best of my knowledge he is the only member of our Class living in Great Britain. His current address is Underwood, Helensburgh, Scotland. — Ralph Ilsley, XII, whose name has appeared before in these notes, is working for the government, and may be reached at the office of the National Bituminous Coal Commission in Washington, D.C. He worked for the Gulf Refining Company a number of years both in this country and in Germany before making his present connection some time ago.

Clarence Lober, a major in the Army Air Corps, is stationed at present at Langley Field, Va. Another of our majors, Ivan Miller, has recently been transferred from San Diego, Calif., to the United States Marine Corps Aviation Headquarters at Washington, D.C. To bring the Navy into the picture, John E. Ostrander, Jr., is now a commander at the Naval Aircraft Factory at Philadelphia, Pa., having come there from his previous station at San Pedro, Calif. — Onslow S. Robinson, I, is with the United States Engineers in Louisville, Ky.

The Boston Society of Civil Engineers sponsored a series of eighteen lectures on hydraulics by Kenneth C. Reynolds, Associate Professor of Hydraulics at

1925 Continued

M.I.T. Undoubtedly a number of our Course I members in the vicinity took advantage of this opportunity to bring themselves up to date on such subjects as the theories and natural laws relating to the flow of fluids, open-channel problems, propagation of waves in channels, and use of river models.

On November 27, Edward J. Wells, II, who was employed by the Simplex Wire and Cable Company of Cambridge, died suddenly. May we take this opportunity to express our regrets, and extend our sympathy to his family. — HOLLIS F. WARE, *General Secretary*, 3 Aquavia Road, Medford, Mass. F. LEROY FOSTER, *Assistant Secretary*, Room 6–202, M.I.T., Cambridge, Mass.

1926

Those of us here in Boston are not entirely happy about Elton Staples' recent decision to move to Chicago, although we are delighted that he will have an opportunity to use his talents in a more extended field. He has resigned from the staff of the Gulf Refining Company to accept the position of manager of the central division of the Hevi Duty Electric Company, builders of electric furnaces. His office is at 205 West Wacker Drive, Chicago. Elton has been active in class affairs and in his home town, Wellesley, has come to be regarded as one of the most outstanding and public spirited of the younger men.

John Jacob has been promoted to service engineer and assistant administrative engineer at the Glenn L. Martin Company. Writes Frank D. Klein'25: "Since this charming young bachelor (adv.) lives in the same apartment house as I do and drives back and forth to work with me, I must admit that he really works very hard. Why don't you and the other respective Class Secretaries write to Ward ['25], Jacob, and Francis ['36], advising them that they should be ashamed to have me do their letter writing for them instead of keeping you up to date themselves? That will doubtless produce more results than my asking them to write to you. . . ." John did better than write; he made a visit to Boston which the Secretary enjoyed very much. — Leon J. Goldberg continues with the General Electric Company in its industrial control design department in Schenectady.

The following item comes from the New York *Herald Tribune* for November 4: "Miss Margaret Edith Pyne, of New York, daughter of Mrs. William H. Pyne, of Malden, Mass., was married here this afternoon to Mr. Alexander H. Brown, Jr. of Detroit, son of Mr. Alexander H. Brown, of the Union League Club, New York, and the late Mrs. Brown. The Rev. Charles Gallagher, of New York, officiated at the home of the bridegroom's brother and sister-in-law, Mr. and Mrs. Courtney C. Brown, and a reception was held." — Harold J. Ryan, former supervising engineer of air conditioning for the Frigidaire division of General Motors, has now established himself as consultant in the installation of custom-built air-conditioning systems to meet special problems. His office is in the Chanin Building, New York City. — JAMES R. KILLIAN, JR., *General Secretary*, Room 3–208, M.I.T., Cambridge, Mass.

1927

The various bits of news that have been received recently are greatly appreciated. Kenneth A. Smith, who burned up the track for us a few years ago, has become Professor Smith at Columbia where he teaches architecture. He has been there four or five years and has packed enough pounds on his frame so that he now looks more like a tackle than a runner. Ken made the New York papers in October when his marriage to Miss Lorna Margaret Hamilton Home of Winchester, England, was announced. The wedding took place on September 16 in England and in time for the Smiths to return to New York on the last trip of the S.S. *Manhattan*. Their address is 509 West 122d Street, New York City. — Selim Lunden is assistant engineer of traffic control for the Connecticut State Highway Department. He is also an accident investigator for the commission. Lunden was married in 1930 and has two children, a daughter seven and a son four. — Arthur Reardon is an ordnance engineer in the office of the chief of ordnance, Munitions Building, Washington, D.C. — Howard Lary has been advanced from associate valuation engineer to regional administrator for the Securities and Exchange Commission. — Ed Wells joined the ranks of the benedicts last spring when he married Miss Marya Martin, and another important event for Ed (and Johns-Manville) happened when he was made chief engineer for the transportation and automotive department.

Glenn Jackson, who is living in Pawtucket, R.I., is still with the United States Finishing Company where he has been for a number of years. He reports that his business carries him to New York quite frequently. Glenn offered very substantial co-operation by sending word about a number of our classmates with whom he has been in touch recently, and I shall quote that part of his letter: "The December 4 issue of the Providence *Bulletin* contained a two-column story about William H. Richards, who has undertaken farming on a scientific engineering basis in Portsmouth, R.I., and is making real progress in developing year-round crops. Employs fifty men — gross sales last year $80,000. The article was so good I have just forwarded it to Ralph Jope'28 for possible further mention in the columns of The Review. Carlton Davies and wife spent a few weeks in New England this summer, at which time we managed to get four Alpha Tau Omegas together at the Jackson rancho — Ray Leonard, Joe Burley, Carl, and myself (with spouses). Joe Burley is very busy with aircraft ignition wire at his Boston Insulated Wire and Cable Company. Ray Leonard is now with C. H. Sprague and Son Coal Company in Boston. Wheaton Hutchison has built a new house in Edgewood, R.I., overlooking the bay, and still peddles chemicals for Mr. du Pont. Dave Truax, who has been selling chemicals and textile finishes for Stein, Hall and Company, Inc., in Providence for the last three years since leaving us (United States Finishing Company), has been transferred within the last month to their Charlotte, N.C., office. John Drisko is around Providence somewhere — with the government on flood-control work. Saw Jimmy Chirurg at the Course XV convocation in June; he has done very well with his own advertising agency — James Thomas Chirurg Company, Park Square Building, Boston.

The New York group had another dinner on the eighth of December, staged under the guiding genius of Bob Bonnar. The following men were present: Tweeddale, Davin, Staples, Rabinovitz, Woolfenden, Smith, Fexy, Lyles, Melhado, Dodge, Kaswell, Felch, Davier, Saliba, Beattie, True, Hinck, Bannon, Bonnar, and Hibbert. Robert Greenwald, Annapolis'21, showed pictures, taken in Europe last summer, which gave us considerable insight on the situation that existed just prior to the war. In addition, his comments were extremely interesting as well as informative. These dinners have proved to be very popular with those who have attended, and plans are now under way to have a meeting some time in March. Anyone in the New York area or elsewhere who has not received notices and who would possibly attend one of these sessions should get in touch with the Secretary or any of the other New York crowd, to be sure of receiving future announcements. Perhaps we can get Glenn Jackson to arrange his New York trips to fit in with one of these meetings.

At the chemical show at Grand Central Palace, your Secretary ran into Dick Hawkins, who is now with the Philadelphia Drying Machinery Company. Dick has been with this outfit for a year and a half and is right now in the process of moving his headquarters from Philaphia to Boston where he will set up an office in the New England Power Building, located right in back of the Copley Plaza. Dick had just seen Bill Taggert, but I, unfortunately, did not meet Bill while I was going around the various exhibits. — RAYMOND F. HIBBERT, *General Secretary*, Care of Johns-Manville Corporation, 22 East 40th Street, New York, N.Y. DWIGHT C. ARNOLD, *Assistant Secretary*, Arnold-Copeland Company, Inc., 22 Summer Street, Boston, Mass.

1930

Ted Riehl, X, continues to be our best copy, for we now have his new address, 1100 Copley Road, Akron, Ohio, and we venture to say that he and his bride will be on the lookout for all of you who are in that vicinity or are passing through. — Also from Ohio comes news that Sid McCuskey is now professor of mathematics and astronomy at the Case School of Applied Science in Cleveland. This seems to be an open season for professors. Jack Vennard, I, is holder of that title at New York University, college of

1930 Continued

engineering, while Hugh Skilling, VI, is a faculty member at Stanford University.

A summary of the activities of Sam Zisman, IV, recently reached your Secretary. Sam writes: "After five years teaching at M.I.T. in the School of Architecture I came to Texas Agricultural and Mechanical College, where I fill the position of assistant professor of architecture. Saved from mere routine of instructing, attending conferences, writing articles and textbooks (one even proved to be rather successful) by carrying on practice of architecture and doing other design. For example, designing textbooks, one of which, for some unaccountable reason, was selected as one of the 'fifty books of the year' in 1938. In the struggle to stay above the depths of a purely professional existence I took a year's leave in 1938 to do some work for the general education board of the Rockefeller Foundation, traveled over the country (at their expense, of course) and wrote several voluminous reports which have undoubtedly been safely filed away. The only other item of interest (chiefly interesting to me, of course) is work with committees of the National Association of Housing Officials and the American Society of Planning Officials. All this leads to the work on housing and planning which I am doing in Texas and at the school. Doesn't life get to be serious?" — Thanks for your note, Sam. — Your Secretary received a most unusual communication yesterday in the form of an announcement engraved in Spanish. For the benefit of the many Course VI men I am going to give the message just as I received it: "*MELCHOR CENTENO V. Y CATON GUEVARA DE CENTENO V. SE COMPLACEN EN OFRECER SU PRIMOGENITO NACIDO EN ESTA CIUDAD EL DIA 19 DE LOS CORRIENTES, NUEVA YORK, N.Y. NOVIEMBRE DE 1939.*" All of which I translate to the effect that our classmate Centeno is the proud father of his first child. Congratulations may be extended at 3657 Broadway, New York City. Your Secretary must confess that he consulted the vocabulary of a Spanish grammar before going to press. — Another reminder of our ten-year reunion, June 1 and 2. We hope to see you there. — PARKER H. STARRATT, *General Secretary*, Bradley Park Drive, Hingham, Mass.

1933

Leonard H. Brauer is engaged to Miss Helen Randlett of Newton Centre. Walter D. Teague, Jr., is betrothed to Miss Harriette L. Barnard of Forest Hills, Long Island. Edward P. Hutchinson, who is instructor and tutor in sociology at Harvard, is engaged to Miss Alice Louise Forbes of Swampscott.

John C. King writes: "Now that I am back in the good *new* U.S.A. again, and settled in a new position, I am sending you my addresses. For mail: care of State Water Policy Commission, 28 West State Street, Trenton, N.J. (I am assistant hydraulic engineer.) We are living at Dela Vista, Washington Crossing, N.J. I hope that any of my classmates passing through (or living in) Trenton will stop by and say 'hello.'" — Thanks, John. — GEORGE HENNING, JR., *General Secretary*, Belmont Smelting and Refining Works, Inc., 330 Belmont Avenue, Brooklyn, N.Y. ROBERT M. KIMBALL, *Assistant Secretary*, Room 3–102, M.I.T., Cambridge, Mass.

1935

It is with regret that we note the passing of another classmate. Herbert Walker, who was with us the first year at school, died October 14 after a long illness.

The Class welcomes another son, Peter Michael, whose proud father is Fred Kraus. Art Greenblatt and Miss Therese Jacobs of Brooklyn are engaged. John Waferling and Miss Kate Greene of Germantown, Pa., will wed. When last heard from, John was a supervising engineer for Merit Engineering Corporation, Maplewood, N.J., on the construction of piers, docks, foundations, and buildings. The marriage of Damon Francisco took place on July 8, and the lucky girl was Thelma Powell, whom he met while at the Mellon Institute in Pittsburgh. — Here is an example of how the European ruckus has affected some of our classmates. In a recent letter to the Alumni Association, George Revell wrote: "In addition to my regular duties as a lecturer in chemical engineering at Queen's University I have taken on work with the Canadian Officers Training Corps. Now that Canada is at war we have a very flourishing branch here of some 700 members. Most of the staff of the university have offered their services to the government in some technical capacity. In addition, the professional institutes have listed their members in certain technical groups for technical aid."

Art Anderson is back from his trip to Germany and Sweden and is now teaching at the Institute. Dick Campbell has left the University of Kansas and has joined the staff at M.I.T. Allan Creighton has left the Waukesha Motor Company and is now with the Electric Boat Company, Groton, Conn. One hears quite a bit nowadays of the activities of the Electric Boat Company in the manufacture of submarines, sub chasers, and "mosquito boats" for the government. (See *Time* for November 25.) Walt Green has completed his graduate studies at M.I.T. and has joined the Gulf Research Development Company in Pittsburgh. John Ostlund is employed by Jorgensen and Schreffler of Miami, Fla. This is the first news we have had of John since '35. Bill Powers has been shifted from Fort Belvoir, which many of us remember as Fort Humphreys, to the Missouri School of Mines where he is instructing R.O.T.C. students. For the first time we have news of Harry Ruane. He is with the Virginia Telephone and Telegraph Company at Luray, Va.

We are getting pretty close to our fifth birthday. Have you made your plans yet to attend the reunion? In conjunction with the reunion, there will be another issue of the class survey; remember the last one? In about a month you will receive a letter announcing the reunion and calling for information for the survey. Have your answers ready and let's make this the biggest event ever. Be seeing you soon. — ROBERT J. GRANBERG, *General Secretary*, Care of W. C. Voss, 9 Old Town Road, Wellesley Farms, Mass. RICHARD LAWRENCE, *Assistant Secretary*, 111 Waban Hill Road North, Chestnut Hill, Mass.

1936

Course VI-A. For our class notes for this month we leap right into a letter from Mart Gilman of General Radio fame. He writes: "To begin the yarn, I will say that Lawrence Peterson dropped in to see me at the office while he was home celebrating Thanksgiving. We had a pleasant chat about ourselves and about the other fellows whom we knew but saw very seldom. Pete brought with him a big sheaf of notes about many of the boys . . . and I will quote, a bit freely in places: 'Pete White was in Schenectady a couple of weeks ago with his wife, the former Dorothy Kendrick, to whom he was married on September 9. . . . Pete, who was formerly with Phoenix Engineering Corporation, is now with Electric Bond and Share Company as the result of some reorganization. He spent some time in Schenectady last spring, when he was using the network analyzer in connection with some work on power networks. He has been active in the New York City branch of the American Institute of Electrical Engineers and presented at least one paper before the group. In order to while away further time, he did some studying at Brooklyn Polytech, where he is working for his doctor's degree. Several courses which he had were given by Edward W. Kimbark '33, whom most of us will remember as our 6.03 alternating-current machinery instructor at the Institute. Pete White said that the last time he had heard from Walt MacAdam he was in Florida with the long-lines department of the American Telephone and Telegraph Company, and Luigi Robinett was working for the same department in Easton, Pa. (The November issue of the *VI-A News* says that Walt MacAdam is engineer in the Atlanta plant group of the A.T. and T. He was awarded a Vail Medal by that company for having saved a man from drowning in a river near Brunswick, Ga., in December, 1938. At the time of the rescue, Mac had been only a month out of the hospital, where he had been suffering from pneumonia.)

" 'Len Wuosma spent several months on test at General Electric in Pittsfield and was then transferred to Schenectady, where his assignment was in the motor and generator calculating room in Building 41, where all the calculations for the tests are made. Here he replaced Norm Willcox, who went to the plastics department in Pittsfield. After a few months on this test, Len moved up a peg and was given a job as an engineer in the motor and generator department. He started off on water-wheel generators, and it must have been a bit involved because he

1936 Continued

had to borrow my M31 book on differential equations. — For some time Bob Caldwell held down in the General Electric test office the job which Mr. Schoonover had while we were co-ops; Bob had charge of all transfers of test men in the Schenectady works and between the different works. In the spring he took a permanent job in the central station department. Rumor has it that he expects to go skiing again this winter, probably accompanied by a cute secretary from the accounting department. After a typical Williams harem-scarem life on test in General Electric, Schenectady, including a short assignment in the central station department, Bob was made a barker at the General Electric exhibit at the New York World's Fair. Here he held forth during the summer, giving short talks and answering questions concerning the awe-inspiring displays. After the Fair, he went back to the central station department in Schenectady.

"'Boris Maximoff left General Electric and went with Hamilton Standard Propellers in East Hartford where things are probably going strong at the present time. — Charlie Rife went back and finished up at Lehigh University after some time spent at General Electric. This fall he went to Harvard Medical School, where he is starting his study for an M.D. degree. — In the Pittsfield works, Bob Hunt has been in the power transformer department with what is known as "big stuff." His marriage to Miss Irene Shirley of Townville, S.C., scheduled for last June 7, has now been safely carried through, I suppose. Charlie Hobson we saw through a window, but he was too much engrossed with his date to spend any time with us. He also was working in the power transformer department. Obie Falls, who was in the commercial section of the same department, has supplied the information that Henry Johnson found the stock and bond business unprofitable and is studying at Harvard Law School. (Obie, by the way, was elected president of the Berkshire Technology Club for 1939–1940.) — We also stopped in to see Mr. and Mrs. Norm Willcox, who seem to be making a success in the housekeeping game.'

"That was a fine batch of notes about the boys, and I surely congratulated Pete. He is now on the accountant staff of the Schenectady works and spends most of his time on special problems in the management field. Getting ready to be a big executive, I guess. Before that he was in the business training course, where he gained experience in several different divisions of the accounting department. Pete has also been active outside his work, and is a director of the Albany chapter of the N.A.C.A. (National Association of Cost Accountants, to the uninitiated).

"There are a few more notes that I can add: Dick Mabee is back at the Institute doing graduate work under Professor Moon '27. I have seen Charlie Rife several times at the new Graduate House, where we have had dinner; he seems to be enjoying the medical line so far. Henry Gibbs is supposed to have entered politics back in the home town of Revere. Al Whitcomb, who married Barbara Day in Lowell on October 7, is still in the engineering department of the New England Telephone and Telegraph Company. Ed Halfmann has just about ended his cadet training period at the Philadelphia Electric Company and by the time this gets into print will probably be a member of the engineering department. Lately he has spent some time on special work which has been along the lines of his thesis. I am still with General Radio as a member of the engineering department. My work consists mainly of answering inquiries and talking with customers when they come to the plant. Last summer I spent some time in our New York office and expect to travel in the mid-West in February, all in the interests of letting people know what we have to offer. . . . Here's for bigger and better '36 notes in The Review." — And we can say that Mart has made a good start toward those bigger and better notes.

A few brief items have come to our attention. First is the wedding announcement of Jack Cook, VI-C, to the former Miss Olga Lupinovich of Maynard, Mass. Jack is still on the staff at M.I.T. — A Christmas card from Bernie Gordon, I, reports that he is still in Little Rock, controlling floods. At present he is assistant in the soils laboratory, United States Engineer Office. — Gerry Blackburn, IX-B, is now a professor at St. Francis Xavier University in Antigonish, Nova Scotia. — Charlie Parce, IX-B, is with Technicolor Motion Picture Corporation in Hollywood. Keep away from those glamor girls, Charlie. — Aurelius Hornor, Jr., XII, is employed by the Cuban Mining Company of Cristo Oriente, Cuba. — Procter and Gamble have transferred Fletch Thornton, XV, to Quincy, Mass. — James Seth, X, is in California with the Tide Water Associated Oil Company. — George Robinson, X, is now working with the Hart Products Corporation of New York City. Further news from members of the Class will be gratefully received by either of your Secretaries. — ANTON E. HITTL, *General Secretary*, 109 Shepard Avenue, Kenmore, N.Y. ROBERT E. SAWYER, *Assistant Secretary*, 55 Robinwood Avenue, Jamaica Plain, Mass.

1937

Each month as I write this soliloquy (it really is, almost), I think: "Ah, well, next month it will be different. Someone will have something to say." And each month it is the same — I fall back on the clipping services supplied by The Review and on my own limited resources in composition. This month was slightly different, however. Dick Young, fuming over no news in the November or December issues, wrote me and really asked if it would be all right for him to take over and try his hand at it. Sure, that's fine, but everyone has news he would like to write and everyone would like to write some, but very few do anything about it.

One of those few was Al Woll, XV, who says he thought there was a moratorium on class news but decided, on second thought, it was because of fellows like himself who won't talk. "Monday night (December 4)," he says, "I attended a dinner and smoker held by the Technology Club of Chicago at the Knickerbocker Hotel. Our Class had a poor showing; only seven of us were present: Bob Brauer, who is with Standard Oil in Whiting, Ind.; Goodwin deRaismes, with American Can; John Fellouris, with International Filter Company; Joe Heal, with American Steel Foundries, Hammond, Ill.; Jim Newman, with Ingersoll Steel and Disc Company; and Bob Thorson, who is with the Texas Company. Of the seven of us, four are now married: Joe, both Bobs, and myself — I being the infant of the marriage cortege. The day before last Labor Day, I was married in Cleveland to Miss Pearl Loeb of Lawrenceville, Ill. I had the good fortune to see among the guests a fair representation of my friends from M.I.T. Those who attended were my brother Eddie '35, II, who was best man; Leon ('38, X) and Paul ('40, XV) Baral; Milt Dobrin '36, VIII, who is with Gulf Research in Pittsburgh; and Walter Haight, XV, who is a safety engineer for the Continental Casualty Company in Cleveland. Two weeks after my honeymoon in Indiana, I was transferred to our new plant in Chicago. Here I am engaged in research and product development of asphalts, mineral and vegetable oils, paints, plastics, and waxes for the Pioneer Asphalt Company, a subsidiary of Wishnick-Tumpeer, Inc. . . ."

Al goes on in his letter: "Names make news; here is who, who is where: Milton Lief is still with Curtiss-Wright in Robertson, Mo.; George Siegelman is in Roxana, Ill., with the Shell Oil Company; George Megerian, when last heard from, was with the General Electric Company in Lynn, Mass.; Bill Healey is working for the General Chemical Company in New York City; Stan Zemansky is still with North American Aviation, Inc., in Inglewood, Calif., and, mind you, married. His wife is the former Anne Alice Person '39, IV, who is an architect in Los Angeles. I just heard from Phil Short, X, who is with Shell Development Company, Emeryville, Calif. We almost wrote an obituary for him last summer, for he was on the *City of San Francisco* when it derailed somewhere out west; anyway you no doubt read about it. . . . Eddie Lynn is now assisting Professor Hauser in colloid at the Institute; Len Seder is with General Electric in Lynn in the development and betterment of products; Joe Heal informed me that Archie Ahmadjian is now working for Lockheed in Burbank, Calif.; Joe Smedile is laboring for Uncle Sam as a shavetail in Savannah, Ga.; and, lo and behold, I found Art York working in the Technology News Service at the Institute when I visited there last May." — Yes, Al, that certainly does fill a big gap, and we are always eager for more and more of the same. Dick says there are 400 who are anxious for news, but I think the figure is nearer 800 or 900.

Dick Young and Vic Kron have both joined the ranks of the married. Dick and Marjorie (Squires — remember?) tell us

1937 Continued

they are very happy. Their address is 285 Edgewood Avenue, New Haven, Conn. Vic was married in Rochester to Miss Honor Agnes Stanton. I don't know where they are living. Received an announcement of the marriage of Miss Elizabeth Stone of Brookline, Mass., and Lester Klashman on October 29. On December 1, Miss Bettie Virginia Sidebottom of Milton, Mass., became the bride of C. Henry Hardwick, 2d. In Elizabeth, N.J., Alice Irene Schem of Roselle and Harry D. Crapon, Jr., were married on November 10. Harry is with the Combustion Engineering Company, Inc., in New York. In December the engagement of Lelia Wyman of Cambridge and Evan Edwards was announced.

From the *VI-A News:* "C. Ronald Smith, formerly with the Vacuum Tube Engineering Department of General Electric, has been appointed to the staff of the E. E. Dept. of the University of Penn. at Philadelphia. He is organizing a new industrial course in electronic control devices." — Frank E. Carney is in business for himself, according to a memorandum I received. He is manufacturing and distributing household products of a chemical nature. He calls his company the Chlorite Chemical Company, and it is located in Taunton, Mass. He supplies laundries, institutions, homes, dairies, and poulterers with bleach disinfectants, detergents, and so on. Success to you, Frank. — Lindsay A. Fowler, who was a special student in Course XIII, is now with the Newport News Shipbuilding and Dry Dock Company. He immediately put his new knowledge to use by personally designing and building the schooner *Achernar* at Hulls Cove, Maine; he sailed this in 1938 to Florida where a son, Samuel Thomas, was born. Mrs. Fowler was formerly Wilma Danforth.

That's about all for now, fellows, but be not afraid — there will be more clippings next month and maybe, just maybe, another letter. — WINTHROP A. JOHNS, *General Secretary*, 245 Hale Street, New Brunswick, N.J.

1938

1938 CLASS NOTES STOP CLASS SECRETARY MARRIED DECEMBER 29 TO MISS JEANNE WATSON DRAKE AT NEW ROCHELLE NEW YORK STOP ASSISTANT SECRETARY SKIING IN LAURENTIANS STOP DALES MARRIAGE ONLY NEWS ANYWAY — LLOYD BERGESON. — DALE F. MORGAN, *General Secretary*, 6 Avon Road, New Rochelle, N.Y. LLOYD BERGESON, *Assistant Secretary*, 885 Beacon Street, Newton Centre, Mass.

1939

Gordon Holbrook, II, is an experimental engineer with the De Laval Steam Turbine Company of Trenton, N.J., and enjoying the job very much. As yet we've had no comments on Trenton. — Al Copp reports from Bucaramanga in Colombia, S.A., that he is employed by a company which is developing a very large deposit of gold placer gravel. At the present time he is in charge of the Keystone drill used for prospecting the area and is located in a semipermanent camp which is expected to continue for about a year. One gold dredge has been ordered and a hydroelectric plant is being planned. Rough roads are under construction, and it is anticipated that about two years hence regular mining operations will be under way and a permanent camp constructed. He describes the climate as terrible, but says that he is, nevertheless, enjoying the country and the work and keeps feeling fit.

George Cremer, IX-B, is working on a laboratory testing job with the Hardy Metallurgical Company. He also writes concerning some of the activities of Course XVI men, describing a neat bungalow inhabited by Fuz Phinizy, El Hawkes, and Bill Jenrick in North Hollywood, Calif. George Estes left them in the fall to work for Hamilton Standard Propellers in Hartford. For other IX-B news, we can report that Basil Gray is a chemist with Hughes-Mitchell Processes, Inc., Torrance, Calif., and that Dick Sears is a junior engineer at Langley Field, Hampton, Va.

Al Chestnut, III, has been working for the Phelps Dodge Corporation at Morenci, Ariz. This company, which is headed by L. S. Cates '02, is developing an enormous body of low-grade copper ore and is conducting large-scale testing operations to determine the best method for treatment of the ore, all looking forward to the construction of a large concentrating plant to go into operation about two years hence and probably to be followed later by a smelting plant. Al is in the engineering division and, at the time he wrote, was working on the cliffs at the ghost town of Metcalf, a job which required the climbing ability of a mountain goat. To set up the transit, one leg had to be stuck tight in a fissure while the other leg dangled in space and Al himself stood on his heels on a narrow ledge. Barry Graham, XV, writes that he is with the Aluminum Company of Canada, Arvida, Province of Quebec, and is enjoying his work. Camille Zeldin, III, has reported that during the summer he obtained valuable experience in underground mining at the Groundhog Mine, Vanadium, N.M., and had reached the position of timberman's helper when he left there in October to take a job at the Valley View Mine, Ivanpah, Calif.

Several announcements of a more matrimonial nature have been coming in slowly and will be summarized in a later issue. — STUART PAIGE, *General Secretary*, Box 207, Greenwich, Conn. MORRIS E. NICHOLSON, *Assistant Secretary*, M.I.T. Graduate House, Cambridge, Mass.

WATERWAY ENGINEERING BY DR. OTTO FRANZIUS

(TRANSLATED BY DR. LORENZ G. STRAUB)

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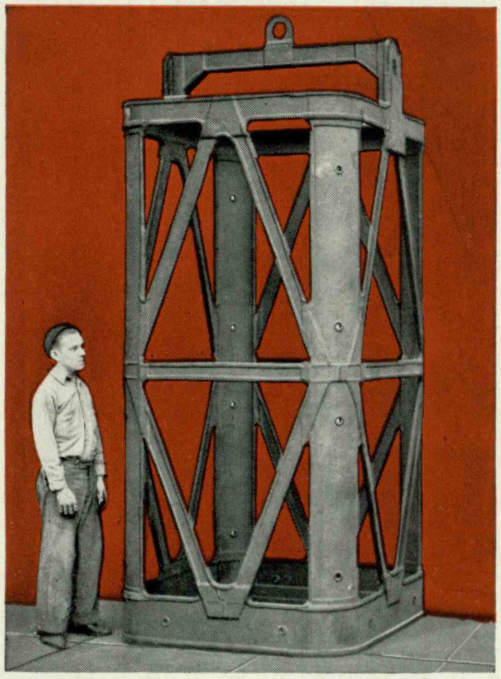

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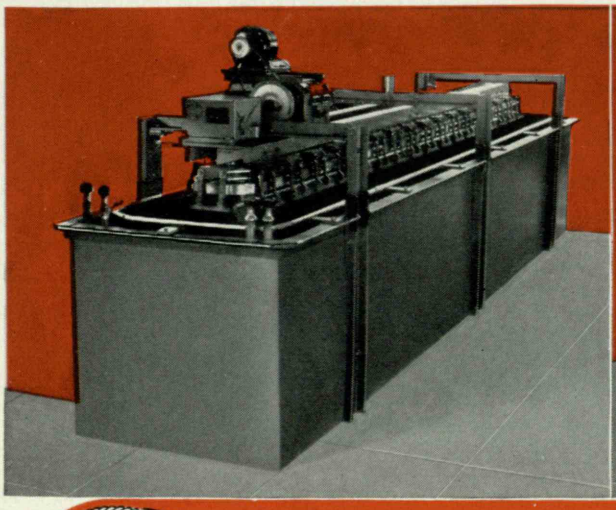

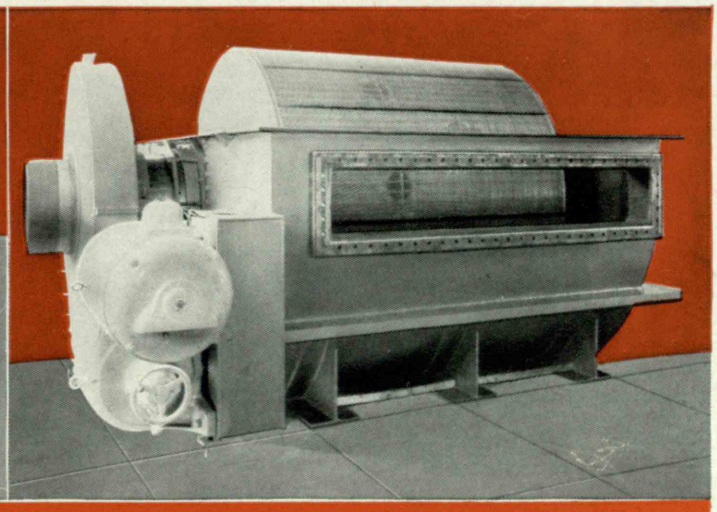

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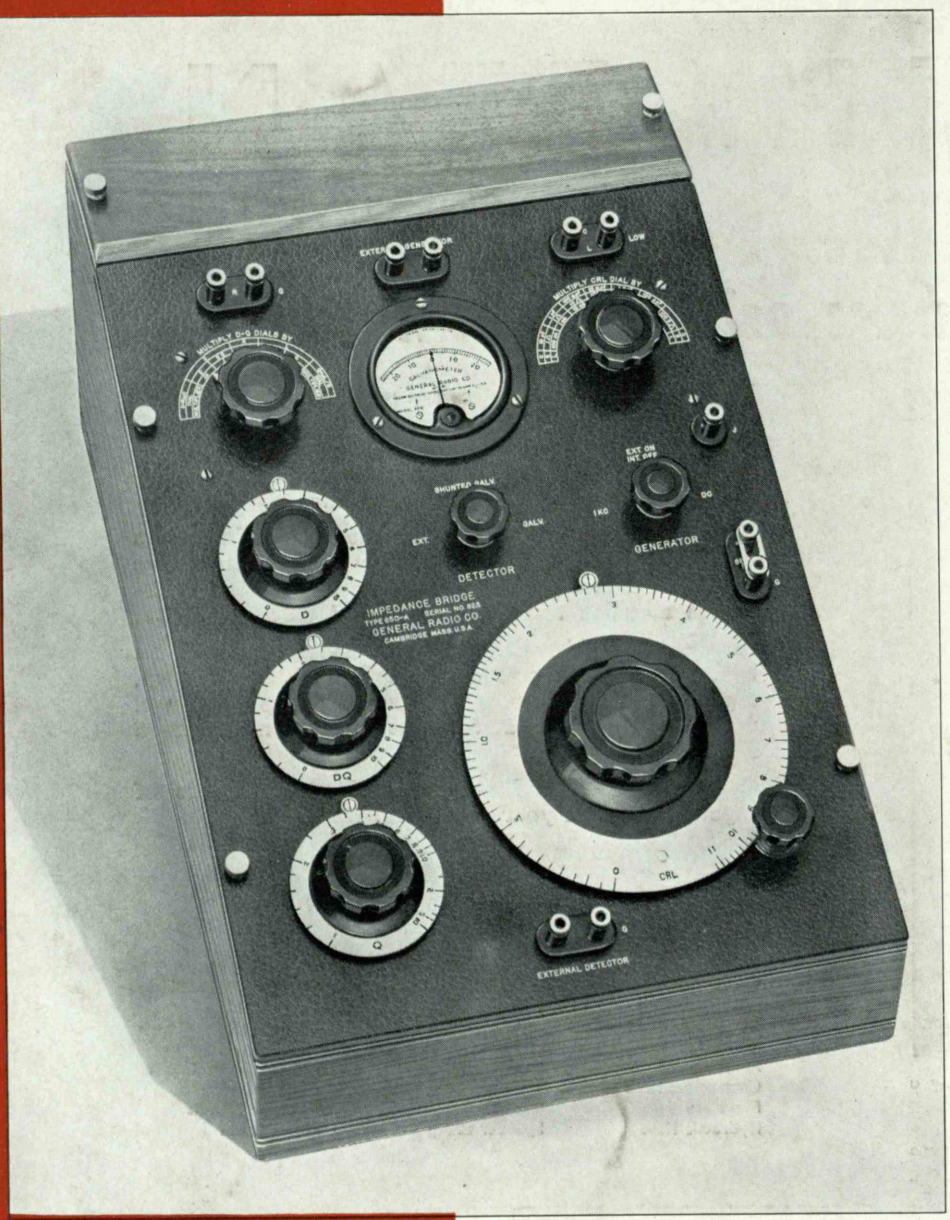

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